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DIFFERENCES IN GRAMMATICAL STRUCTURES WRITTEN AT THREE GRADE LEVELS, THE STRUCTURES TO BE ANALYZED BY TRANSFORMATIONAL METHODS.

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THE WRITING OF SCHOOL-AGE CHILDREN WAS STUDIED TO DEVELOP MORE REVEALING PROCEDURES FOR STRUCTURAL ANALYSES OF GRAMMAR. THE WRITINGS OF 54 BOYS AND GIRLS FROM GRADES 4, 8, AND 12 WERE SELECTED AND ANALYZED BY GRADUATE STUDENTS AND THE PROJECT INVESTIGATOR. THE SENTENCE STRUCTURES WERE ANALYZED BY TRANSFORMATIONAL METHODS, WITH EVALUATION MADE ON SENTENCE LENGTH, CLAUSE LENGTH, SUBORDINATE CLAUSES, AND A NEW TERMINABLE UNIT. THIS NEW UNIT WAS EVOLVED BY SEGMENTING THE WRITINGS INTO THE SHORTEST PASSAGES WHICH WERE GRAMMATICALLY ALLOWABLE. THE TERMINABLE UNIT WAS FOUND TO HAVE THE HIGHEST CONTINGENCY COEFFICIENT, AND THE MAJOR EXPANSION APPEARED TO BE WITHIN NOMINAL STRUCTURES. FURTHER RESEARCH WAS SUGGESTED ON THE TERMINABLE UNIT. (RS)

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DIFFERENCES IN GRAMMATICAL STRUCTURES WRITTEN AT THREE GRADE LEVELS, THE STRUCTURES TO BE ANALYZED BY TRANSFORMATIONAL METHODS

COOPERATIVE RESEARCH PROJECT # 1998

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1. INTRODUCTION

The Major Problem

The teacher of writing can hardly believe that sentence structure doesn't grow. He can hardly believe that growth occurs in punctuation skill, in spelling, in vocabulary, but not in the syntactic structures that make up sentences. "Surely the youngster with diploma in hand can write structures he never wrote in the fourth grade when he was scarcely more than half as old or half as big. Surely his increased power of expression affects not just the words he uses, but affects, too, the invisible web that binds meaningful words into still more meaningful sentence structures." Something like this is one of the writing teacher's articles of faith.

The writing teacher is deeply attached to this rather vaguely-stated belief. He doesn't have time to mark as many papers as he wishes he could, but he hates to think that he wastes his time when he does propose what he thinks is a more mature sentence structure.

Actually, of course, the writing teacher might be wrong. Perhaps the learning of structures has all occurred before a child begins to write. Perhaps by the time the child transfers his speech patterns to written patterns his constant speaking and listening has already taught him everything he will ever learn about sentence structure. Perhaps the language provides so limited a number of structures that the fourth grader has learned to write them all. The problem remaining for him would then be to combine these in a wider and wider variety of ways, adapting them to his purposes of communication.

Perhaps the twelfth grader writes in the same structures as the fourth grader, but uses them somehow "better." At the present time it would be hard to define this "better" or "worse" except in qualitative, subjective terms.

The problem has another aspect. At present in the schools the description of the various syntactic structures is taught at a wide variety of grade levels, some instruction beginning in the earliest grades and some lasting until high school graduation and even into college. Something must be taught first and something last, but what should come first and what last is an open question. If we knew what structures tend to be used at the different grade levels, such knowledge might be one consideration, though not the only one, in helping to decide what should be taught when.

The General Aim For The Study

A great many attacks have been made upon the question of how the sentence structures, or syntactic structures, used at one grade differ from those used at another. The present study aims to attack that same question, using quantitative rather than qualitative methods, and covering writing rather than speech.

However, the present study does not intend just to apply the established procedures to another sample of writing. Established procedures will be used in the first part of the study, but mainly with the hope that something can be said about the relative significance of those various procedures. More important, however, is the hope that new procedures can be devised and that their significance can be given some evaluation too.

In order to undertake new methods of analysis the body of writing will be kept smaller than that used in some of the biggest studies. Secondly, a larger sample of writing from each individual will be used; one thousand words. Third, in order to maximize the chance of finding significant differences between grade levels, a long time span will be used. Fourth, only "average" IQ students will be used.

Related Research

No detailed review of language development studies need be given here since such a review was made by McCarthy in 1954 and by Carroll in 1957.

It has become almost standard procedure in studies like this one to figure mean sentence length, mean clause length and subordination ratio. Subordinate clauses are usually divided into noun, adverb and adjective types, and the frequency of each type is studied. Adverbial clauses are often sub-classified according to different categories of meaning.

Much that same sort of analysis will begin this study, though a somewhat different unit will be studied along with sentence length, clause length, subordination ratio, and kinds of subordinate clauses. The study will then move into an analysis of structures within the clause: coordinated structures, nominals, the verb auxiliary, the main verbs and complements, modifiers of verbs, and predicate adjectives. This kind of analysis of structures within the clause has not, to the investigator's knowledge, been undertaken before. This analysis is quite different from the parts of speech analyses that have been made.

Among those investigators who have contributed to what has been called here the standard procedure are Bear, Davis, Frogner, Heider and Heider, LaBrant, Stormzand and O'Shea, Watts.

2. PROCEDURE

The Choice of Grades

The fourth grade seemed a good place to begin. Before the fourth grade, children may jabber away with ease, fluency and exuberance, but most third graders write only under considerable duress. Any parent who has tried to get his third grader to write thank-you notes after Christmas knows that it is no harder to pull a tooth that isn't ready to come than to extract writing that isn't yet ready to come. But by the fourth grade, most average children are ready to write.

The twelfth grade seemed a good place to stop. If there is any change at all, a span as long as eight years could certainly be expected to catch most of it. If the change is only slight, then a span this long might be needed to show what little there is.

If it is true that the student of only average ability seldom in later life writes much better than he did in the twelfth grade, then the period from fourth to twelfth could be thought of as covering roughly the span from the beginning of a child's writing to his full maturity.

Exceptional students continue to improve, no one doubts, well into later years. G. B. Shaw was the latest of late bloomers. But this study does not concern itself with superior students, only with "average" ones, students with IQ scores of 90 to 110.

The eighth grade was chosen simply to provide a check point halfway between fourth and twelfth. If differences should appear it would be interesting to know whether they seemed to appear in the first half or the second half of the period, or equally in both. The gainss might be early or late or steady.

The Specifications For The Writing

In preparation for the study, all fourth, eighth and twelfth graders at the Florida State University School were given the Short Form of the California Mental Maturity Test. The school population is such that it was barely possible to find in each grade nine boys, plus one or two extras, and an equal number of girls whose IQ scores were not above 110. The extras were needed in case of dropouts. Where more than ten or eleven were available, selection of the ten or eleven was made on a basis that had nothing to do with the ability of the student.

In classes where these ten or eleven were enrolled, all students were given the same writing assignments even though the teacher knew that not all writings would be analyzed.

The teachers were told, "During this trimester, have each student write more than a thousand words. Let his subject matter be typical of what he is writing on now. Make sure that all writing is done under your supervision so there can be no contamination from any outsider. Make no changes in what the student hands in to you. Merely count his words to see when he has produced a thousand words."

Of course the subject matter chosen by the fourth graders was different from that of the eighth graders, but the aim of the study was to learn what students do write freely, not what they can write. To discover what they can write would best be approached in quite a different way. At a very few points the differences in subject matter between grades appeared to make a difference in sentence structure. Those differences will be pointed out as they arise.

Out of the group originally chosen because of their IQ scores, nine boys and nine girls from each of the three grades were finally selected to have their writings analyzed. If writings from one or two extra students were available, the student whose writing contained the most quoted dialog was dropped, the notion being that speech patterns were less to be studied than written patterns.

The number of words for each student was counted, and each student's sample was terminated at the end of the sentence closest to the thousandth word.

The writings were then typed up with the spelling corrected, since misspellings were of no concern in this study. Nothing else was changed. A number code rather than the student's name appeared on each paper.

The Grammatical Analysis

The kind of grammatical analysis used here will be described in some detail at appropriate places in the study. Transformational methods were used at various points, and at those points they will be explained. Wherever a procedure can be discussed as well in traditional terms as in transformational terms, the traditional terms are used, simply because they are familiar to more readers.

One special explanation needs to be made at the outset for the reader who is familiar with transformational grammars. In both Chomsky's and Lees' expositions, transformations are provided to produce certain single sentences. They are needed, for instance, to convert affirmative strings into negative strings. This study is not concerned with such transformations. As Chomsky says,"In addition to the transformations listed above which convert sentences into sentences ... we must construct others which convert pairs of sentences into single sentences." (Proceedings of the Third Texas Conference, p. 142) These alone are of interest in this study. Rather than explain the difference between the two kinds, using the terms unary transformations and binary transformations, or simplex and generalized, only the one kind is ever discussed. Usually it is called a "sentence-combining transformation," but whenever the term "transformation" alone is used, the kind that "converts pairs of sentences into single sentences" is intended.

The motivating interest for the director of the project was to see, in at least general terms, whether older students appear to use a larger number of sentence-combining transformations than do younger students.

Several graduate students were chosen to begin the analysis. Each had taught English composition for at least one year, and each had taken a graduate course in English grammar from the director of the project. They studied intensively the writings of Noam Chomsky, especially "A Transformational Approach to Syntax," delivered as a paper at the Third Texas Conference on Problems of Linguistic Analysis in English in May, 1958. They also studied intensively Lees' The Grammar of English Nominalizations, as well as the mimeographed revisions which Professor Lees made available for this project. In addition they studied selected journal articles.

They and the director of the project then began the analysis. At first a small fraction of the student writing was analyzed intensively. It was approached and tabulated in every way the investigators could think of that showed any promise. Finally a routine was established and certain things were selected for tabulation. Clearly not everything could be tabulated. They proceeded, as best they were able, to break every sentence down into the kinds of kernel sentences and the kinds of sentence-combining transformations which would produce it. They were at times painfully aware that they did not command a knowledge of grammar adequate for the task. Their analysis could be no better than interim, awaiting a better one. For instance, they made no attempt at analysis of pre-articles. At other points they lumped together structures which they were able to separate but which seemed to reveal no more when separated than when lumped together.

When half the materials were analyzed all work done so far was summarized and analyzed. Procedures which seemed to yield no significance were dropped, and others were instituted.

Before any analysis was allowed to stand, it was checked independently by each of two graduate student analysts and ultimately, in case of doubt, by the director of the project.

Certain Short-cuts In Reporting The Findings

Since the reader is henceforth to understand that each student wrote close to a thousand words (usually within one per cent of a thousand), a statement that a student did something a certain number of times need not by followed by the words "in a thousand words of writing."

Similarly, since there were the same number of students in the population of each grade (and each student wrote the same amount), a statement that fourth graders did something so often whereas eighth graders did it this often need not be followed by the words "in the same amount of writing," nor the words "in eighteen thousand words."

And since the number of boys equaled the number of girls in each grade and thus in the whole population, a statement about the performance of one sex compared with that of the other will not need to be followed by the statement "in equal amounts of writing."

Certain tedious repetitions can thus be avoided.

Furthermore, in reporting the number of occurrences of something in the three grades, the order of the occurrences, unless otherwise specified, will always be for the fourth grade first, the eighth grade second, and the twelfth last -- the time order. To indicate whether the change from grade to grade is of large proportions or small, percentages will sometimes be used. (The change was from 43% to 87% to 100%.) When that is done, the number of occurrences for twelfth graders will always be taken as 100% -- as if twelfth grade performance were the target toward which younger students moved.

SUMMARY OF PROCEDURE

1. The students whose writings were analyzed were selected from those receiving scores of 90-110 on the California Test of Mental Maturity (short form). All were from the University School of the Florida State University at Tallahassee.

2. Nine boys and nine girls were selected from each of three grades: 18 per grade, 54 in all.

3. The grades were fourth, eighth and twelfth.

4. Close to one thousand words of writing was used from each student. Usually the number of words was within one percent of one thousand.

5. The writing was done in class and was not altered by anyone other than the writer.

6. The subject matter was not controlled. It was whatever the students were writing on.

7. The analysis was done by specially trained graduate students in English, and by the investigator.

3. FINDINGS: MEASURES OF SENTENCES, CLAUSES AND TERMINABLE UNITS

Garbles

Before the writings could be analyzed, a small amount of foreign matter had to be excluded. A piece of this foreign matter, called a garble, was any group of words that could not be understood by the investigators. Garbles had to be excluded, of course, for what cannot be understood cannot be analyzed. Here is a passage from the fourth grader who committed the most garbles. The garble is underlined. Where the investigators felt sure that a word was merely a wrong inflection the correctly inflected form appears in parentheses.

> The man (men) burned the whales to make oil for the lamps in the town. And the man in the little boats and the white whale eat (ate) the boats up and the white whale went down and came up and eat (ate) The other up too and the rest came back to the ship.

What are here called garbles are comparable to what Strickland and Loban call mazes.

Even a mature writer may jot down in his first draft sentence beginnings or alternate wordings which he later decides not to work into his sentences. However, the mature writer deletes these jottings so that they never appear in the final communication.

A few of these students, however, allowed their garbles to stand undeleted. It is entirely possible that they never re-read what they had written before they handed it in to the teacher. The teacher was instructed to let stand whatever was handed in.

Two eighth graders and two twelfth graders each allowed one garble to stand unrevised and undeleted. Fourth graders committed more. One distinguished himself with fourteen garbles totaling 68 words. Another committed three totaling 10 words. Two others committed one each. All these fourth graders were boys. The nine girls committed no garbles. (See Table 1.) Both groups had the same teacher and were given the same instructions.

How Objective An Index Is Sentence Length?

A natural place to begin a quantitative study of writing development is with sentence length. Adults are likely to have the impression that "younger children write short sentences." Several investigators have checked this matter, two of the most substantial studies having been made by Storzand together with O'Shea, and by Heider and Heider.

Before any discussion of sentence length can be meaningful, however, one must know what is to be taken as a sentence. Obviously a sentence might be taken as whatever a student wrote between one set of end punctuation marks and the next. Such a definition has the advantage of being objective. Anyone can see a period, an exclamation mark, a question mark and a capital letter. A second investigator could be expected to confirm the results of a first.

But the investigator who defines a sentence in this way may feel uncomfortable. If he reads while he counts he will become aware that a fourth grader builds sentences better than he punctuates. Certain children simply neglect ever to use periods. Others write innumerable and's where an educated adult would have written periods; they under-punctuate.

If a sentence is defined as whatever is written between terminal marks, and if sentence length is assumed to be an index of language

Table 1--Number Of Garbles And Words In Garbles For Each Student

Grade 4			Grade 8			Grade 12		
Student number	Garbles	Words in Garbles	Student number	Garbles	Words in Garbles	Student number	Garbles	Words in Garbles
Boys			Boys			Boys		
4-1	14	68	8-1	None		12-1	-	-
4-2	-	-	8-2			12-2	-	-
4-3	-	-	8-3			12-3	-	-
4-4	-	-	8-4			12-4	-	-
4-5	-	-	8-5			12-5	-	-
4-6	3	10	8-6			12-6	-	-
4-7	-	-	8-7			12-7	-	-
4-8	1	3	8-8			12-8	-	
4-9	-		8-9			12-9	1	10
Group Total	18	81				Total	1	10
Girls			Girls			Girls		
4-10	None		8-10	-	-	12-10	-	-
4-11			8-11	-	-	12-11	-	-
4-12			8-12	1	5	12-12	1	2
4-13			8-13	-	-	12-13	-	-
4-14			8-14	-	-	12-14	-	-
4-15			8-15	-	-	12-15	-	-
4-16			8-16	-	-	12-16	-	-
4-17			8-17	-	-	12-17	-	-
4-18			8-18	1	2	12-18	-	-
Group Total			Group Total	2	7	Group Total	1	2
Grade Total	18	81	Grade Total	2	7	Grade Total	2	12

maturity, then the child who under-punctuates the most or uses and the most will, regrettably, be credited with the greatest language maturity.

Confronted by an insufficiency of periods or an over-abundance of and's, an investigator is tempted to edit the child's sentences, putting in periods "where they ought to go." The trouble with this re-punctuating procedure is that it lacks objectivity, reliability. Not all investigators would agree on "where periods ought to go." Where one might put a period another might put an and or a semi-colon or even a comma. The length of such editorially re-punctuated sentences would depend on the taste and judgment of the investigator.

Defining a sentence as "a complete thought" is no solution. No thought is ever so complete that, by adding more relevant material to it, it cannot be made still more complete. How long is a completed thought? Perhaps a sentence long, perhaps a paragraph long, perhaps a whole book long.

Even formal grammar offers no solution. Formal grammar tells how short a sentence can be, but not how long it may be if the writer is allowed to use and to join a given sentence to its neighbor. In his Structure of English C. C. Fries presents a passage which he says a group of teachers will cut into any number of sentences from three to nine.

Statements about the length of edited, re-punctuated units will not convey to a reader much objective information about children's writing. Other investigators have complained of this. Harrell, in his review of the literature, remarks that "Most studies using the sentence as a measure have not defined a sentence (p. 20)." He then comments upon the arbitrariness of the decisions made by one of the major investigators.

The Average Length Of Sentences In Three Grades

One of the first operations in this study was to count in each student's writings the number of passages set off with capital letters and periods or other terminal punctuation. For each student this number was then divided into his total number of words -- usually within one percent of a thousand -- to get the average punctuated sentence length. Those averages for each student, each grade and each sex within grade appear in Table 2.

The averages turn out to be larger for each successively older grade. Fourth graders average 13.4 words, eighth graders average 15.9, twelfth graders average 16.9.[1]

Though average sentence length does increase with successively older grades, it is a far from satisfying index of individual maturity as we see from Figure 1. The student with the highest average of all was an eighth grader. His average was 30 words, almost twice that achieved by the average twelfth grader. One fourth grader averaged sentences longer than those by any one of the eighteen twelfth graders. This fourth grader was far from precocious in language skills, as will be shown in the next section.

Too Many And's Or Not Enough Periods

The reason that sentence length is no better than it is as an index

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[1] Stormzand and O'Shea as well as Heider and Heider, respectively, report average "sentence" length for fourth grade to be 11.1 and 10.9 words, figures smaller than the 13.4 words reported above. For eighth graders they report, respectively, 15.2 and 13.7, a figure again smaller than the 15.9 reported above. For twelfth grade Stormzand and O'Shea report 19.8 words, a figure larger than the 16.9 reported above. (See summary by McCarthy, p. 550) Heider and Heider's "sentences" do not follow the student's punctuation, Stormzand and O'Shea do not specify what they count as a sentence.

Table 2--Mean Length Of Punctuated Sentences For Each Student

Grade 4		Grade 8		Grade 12	
Student number	Mean length of sentence	Student number	Mean length of sentence	Student number	Mean length of sentence
Boys		**Boys**		**Boys**	
4-1	12.0	8-1	13.3	12-1	18.1
4-2	13.1	8-2	12.0	12-2	14.8
4-3	12.2	8-3	12.5	12-3	13.4
4-4	21.5	8-4	13.6	12-4	19.1
4-5	10.8	8-5	15.6	12-5	23.1
4-6	24.6	8-6	29.7	12-6	20.3
4-7	10.9	8-7	19.4	12-7	20.3
4-8	22.4	8-8	11.0	12-8	16.3
4-9	10.3	8-9	22.0	12-9	14.9
Group mean	15.3	Group Mean	16.5	Group Mean	17.8
Girls		**Girls**		**Girls**	
4-10	10.7	8-10	14.6	12-10	16.3
4-11	9.7	8-11	18.6	12-11	21.0
4-12	9.7	8-12	16.8	12-12	13.2
4-13	13.9	8-13	13.6	12-13	13.3
4-14	9.7	8-14	17.0	12-14	20.2
4-15	17.0	8-15	13.1	12-15	13.6
4-16	13.4	8-16	13.6	12-16	14.6
4-17	9.3	8-17	13.4	12-17	18.0
4-18	11.4	8-18	16.2	12-18	14.2
Group mean	11.6	Group mean	15.2	Group mean	16.0
Grade mean	13.4	Grade mean	15.9	Grade mean	16.9

As a result of an analysis of variance, 2 x 3 factorial, the significance for sex and for grade was found to be at the .05 level.

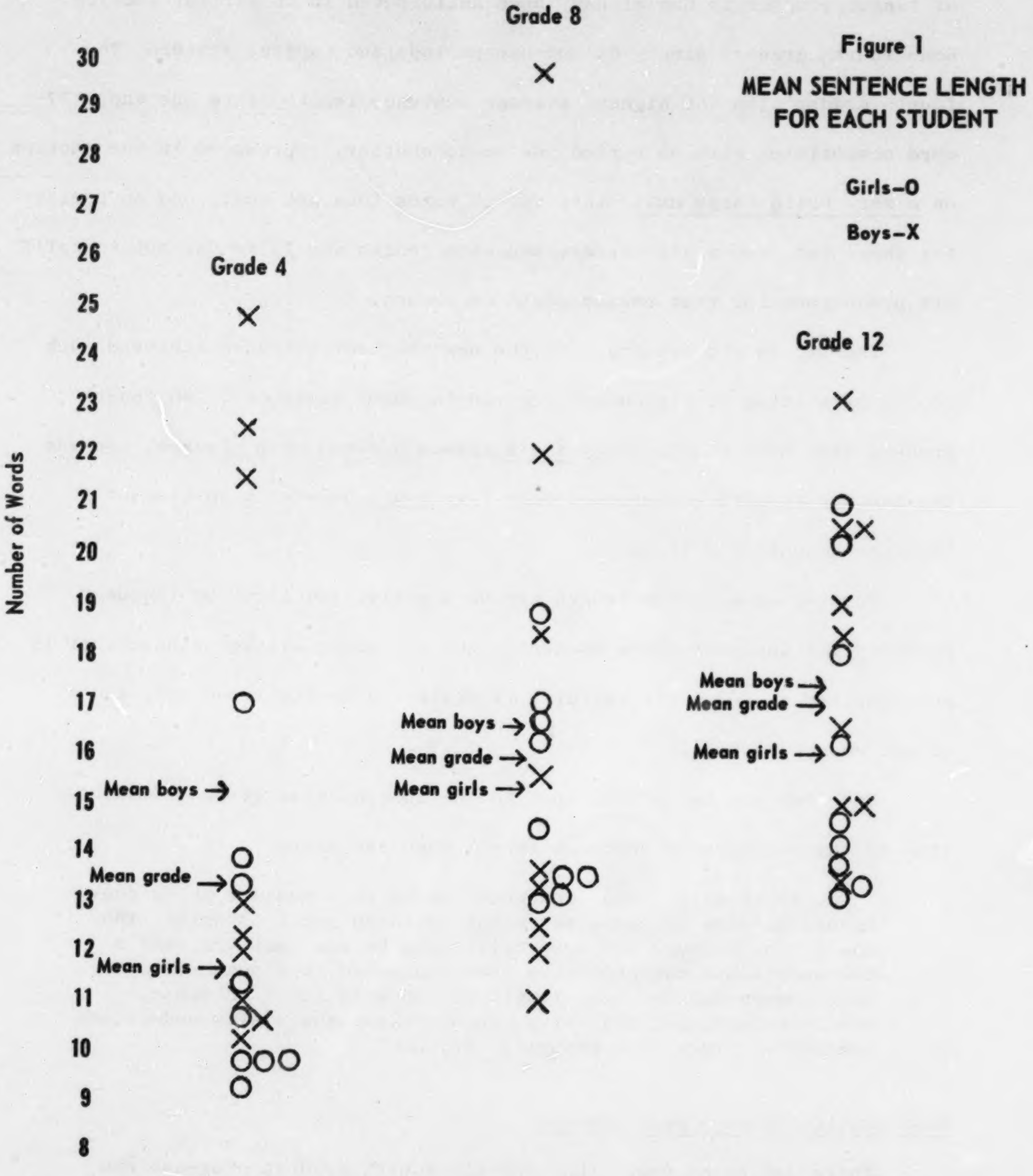


Figure 1
MEAN SENTENCE LENGTH
FOR EACH STUDENT

of language maturity has already been anticipated in an earlier section. Some fourth graders simply do not use periods and capital letters. The fourth grader with the highest average sentence length wrote one whole 77-word composition with no period. He wrote another, reproduced in the section on A more valid large unit, that was 68 words long and contained no period. For those two themes his average sentence length was 72 words, but to call him precocious for that reason would be absurd.

The two fourth graders with the next highest averages achieved such scores by writing prodigiously long run-together sentences. Two fourth graders used more than seventy and's apiece between main clauses, whereas the average twelfth grader used only five and's between main clauses in the same amount of writing.

Punctuated sentence length may be a satisfying index of language maturity for superior older students, but for young average students it is not. Applied to them, its validity is distorted by their too many and's or not enough periods.

McCarthy was testifying more to the inadequacies of other measures than to the adequacy of sentence length when she wrote

> Apparently, then, sentence length is a measure which continues to show increase in normal children until maturity. The use of the measure has been criticized by some writers, and a few substitute measures have been suggested, but none seems to have superseded the mean length of sentence for a reliable, easily determined, objective, quantitative and easily understood measure of linguistic maturity. (p. 550)

Coordination Between Main Clauses

There can be no doubt that certain fourth graders over-use and between main clauses. Those two out of eighteen who used it more than seventy times in a thousand words can be said to have exceeded the stylistic bounds of standard English. Setting those individuals aside as extreme cases, there still remains a distinct tendency for fourth graders to use and more than older students do, as Table 3 shows. Eighth graders use and more than twelfth graders. In fact and tends to decrease with successively older grades until twelfth graders average only 4 in a thousand words.

The child who writes and excessively is perhaps merely trying to hold attention as when, in speaking, he continually uses and-uh instead of dropping his voice.

And is the only one of the coordinators between main clauses about which one could say that fourth grade usage is non-standard. The other two common coordinators, but and so, are used with mature moderation, though indeed it is true that fourth graders used a few more than the older grades. Apparently coordination in general between main clauses decreases with successively older grades, for the total for each grade is 574, 284, 172. In percentages the decrease is 334%, 165%, 100%.

Though the matter of coordination inside clauses will be discussed in a later section, one aspect of that discussion is pertinent here. In the coordination of individual subjects, verbs, prepositional phrases, etc., within a clause, fourth grade usage is entirely mature. That is true of and as well as the other coordinators.

It is, then, in the use of and alone, and in that word's use between main clauses only, that fourth grade usage is not mature.

The over-use of and between main clauses is a stylistic offense, not a grammatical offense. It is grammatically allowable for almost any two

Table 3--Coordinators Between Main Clauses For Each Student

Grade 4					Grade 8					Grade 12				
Student number	And	But	So	Other	Student number	And	But	So	Other	Student number	And	But	So	Other
Boys					Boys					Boys				
4-1	77	4	-	-	8-1	5	2	-	-	12-1	7	-	-	-
4-2	11	10	6	-	8-2	2	8	1	-	12-2	2	3	-	-
4-3	11	5	7	-	8-3	7	4	-	-	12-3	4	1	1	-
4-4	47	2	4	-	8-4	7	3	-	-	12-4	7	1	-	Or(1)
4-5	11	0	6	-	8-5	7	2	3	Or(1)	12-5	6	3	-	-
4-6	75	10	5	-	8-6	5	6	4	Or(3)	12-6	3	3	-	-
4-7	11	4	1	-	8-7	5	8	1	-	12-7	8	-	-	-
4-8	29	4	1	-	8-8	5	7	-	Or(1)	12-8	3	3	1	Or(1)
4-9	8	4	6	Nor(1)	8-9	10	15	7	-	12-9	3	2	1	-
Group Total	280	43	36	1	Group Total	53	55	16	5	Group Total	43	16	3	2
Girls					Girls					Girls				
4-10	8	6	10	-	8-10	7	5	4	-	12-10	4	4	3	-
4-11	9	3	2	-	8-11	19	6	3	-	12-11	11	10	-	-
4-12	14	2	2	-	8-12	2	1	1	-	12-12	3	6	1	-
4-13	7	6	3	-	8-13	4	1	1	For(1)	12-13	-	7	-	For(1)
4-14	18	3	2	-	8-14	12	6	4	For(1)	12-14	2	2	1	-
4-15	25	9	6	-	8-15	20	4	1	-	12-15	4	-	-	For(2)
4-16	26	7	10	-	8-16	9	2	5	-	12-16	4	8	-	-
4-17	5	1	3	-	8-17	19	3	1	-	12-17	4	5	1	-
4-18	16	7	4	-	8-18	7	4	2	-	12-18	12	11	1	Or(1)
Group Total	128	44	42	-	Group Total	99	32	22	2	Group Total	44	53	7	4
Grade Total	408	87	78	1	Grade Total	152	87	38	7	Grade Total	87	69	10	6
Grade mean	23	5	4		Grade mean	8	5	2		Grade mean	5	4	1	

As a result of an analysis of variance, 2 x 3 factorial, the significance of and was found to be for grade at the .01 level and for sex at the .05 level.

adjoining declarative sentences to be connected with an and. The fourth grader's offense is that he exercises that option too often.

If the writings of these fourth graders are representative of writings from beginners in general, then the number of compound sentences could be expected to vary inversely with maturity -- unless the sentences are edited into "properly" compounded sentences. In designing any arbitrarily weighted scale such as that suggested by Davis and used by several recent investigators, it would appear to be better not to assign positive scores to compound sentences written by beginners. Of course one might also ask, "Why bother with any unit that is arbitrary?"

The Search For A More Valid Index: Clause Length

There have been those investigators who doubted the validity of sentence length as an index of maturity. LaBrant was one of these, Seegers and Harrell were others. Because of this belief LaBrant turned her attention to clauses instead. "The clause rather than the sentence is used because it is impossible to determine what constitutes a sentence in an individual's oral or written composition, unless the sentence be perfectly punctuated by marks or intonation (p. 482)."

She checked the average length of clauses for students from grades 4 to 9 and concluded "Examination...reveals an insignificant variation in the number of words per clause (p. 460)." Nonetheless she reports an average of 6.6 words per clause for students of mental age 121-130 months (fourth grade) and 7.6 words for students of mental age 171-180 (eighth grade). Furthermore, she found that eminent psychologists wrote much longer clauses: they averaged 15.2 words per clause.

For each student in this study the number of words written was divided by the number of clauses of all sorts to obtain an average length of clauses. The results appear in Table 4.

The average for all fourth graders is the same as that reported by LaBrant, 6.6 words. The average for eighth graders is higher than that for fourth graders, and higher too than that reported by LaBrant for her eighth graders: 8.1 words, as contrasted with her 7.6 words. The average for twelfth graders was 8.5.

However, there was considerable over-lapping among individuals, as Figure 2 indicates. Only four fourth graders over-lap the next higher grade, but 14 out of 18 eighth graders over-lap the next higher grade.

Average clause length appears to have some validity for distinguishing fourth graders from eighth graders, but not eighth from twelfth.

The Search For A More Valid Index: The Subordination Ratio

Concluding that neither sentence length nor clause length was a significant index of maturity, LaBrant studied the frequency of subordinate clauses. She used what she called the subordination ratio. This ratio has often been described as the number of subordinate clauses divided by the number of all clauses both subordinate and main. This description is not quite what LaBrant used, but that difference will be discussed in a moment. She found that the ratio increased with both mental age and chronological age, and that, of the two, chronological age correlated more highly with the subordination ratio.

LaBrant did not use the number of whole clauses in her study, but instead the number of predicates. After giving the example "I am studying

Table 4--Mean Length Of All Clauses For Each Student

Grade 4		Grade 8		Grade 12	
Student number	Mean length all clauses	Student number	Mean length all clauses	Student number	Mean length all clauses
Boys		Boys		Boys	
4-1	7.1	8-1	7.9	12-1	9.5
4-2	6.2	8-2	8.8	12-2	9.4
4-3	7.5	8-3	8.9	12-3	7.5
4-4	6.6	8-4	9.4	12-4	8.7
4-5	6.2	8-5	8.3	12-5	10.3
4-6	6.4	8-6	9.0	12-6	9.4
4-7	6.7	8-7	8.5	12-7	11.0
4-8	6.3	8-8	6.9	12-8	9.6
4-9	6.7	8-9	9.2	12-9	7.8
Group mean	6.6	Group mean	8.3	Group mean	9.1
Girls		Girls		Girls	
4-10	6.2	8-10	7.6	12-10	7.6
4-11	6.6	8-11	6.9	12-11	7.6
4-12	6.9	8-12	9.3	12-12	7.7
4-13	6.4	8-13	8.2	12-13	8.0
4-14	6.4	8-14	7.7	12-14	8.7
4-15	7.5	8-15	7.2	12-15	8.1
4-16	6.4	8-16	7.8	12-16	8.9
4-17	6.5	8-17	7.8	12-17	7.5
4-18	6.6	8-18	8.9	12-18	7.5
Group mean	6.6	Group mean	7.9	Group mean	7.9
Grade mean	6.6	Grade mean	8.1	Grade mean	8.5

As a result of an analysis of variance, 2 x 3 factorial, the significance for sex and grade was found to be at the .01 level.

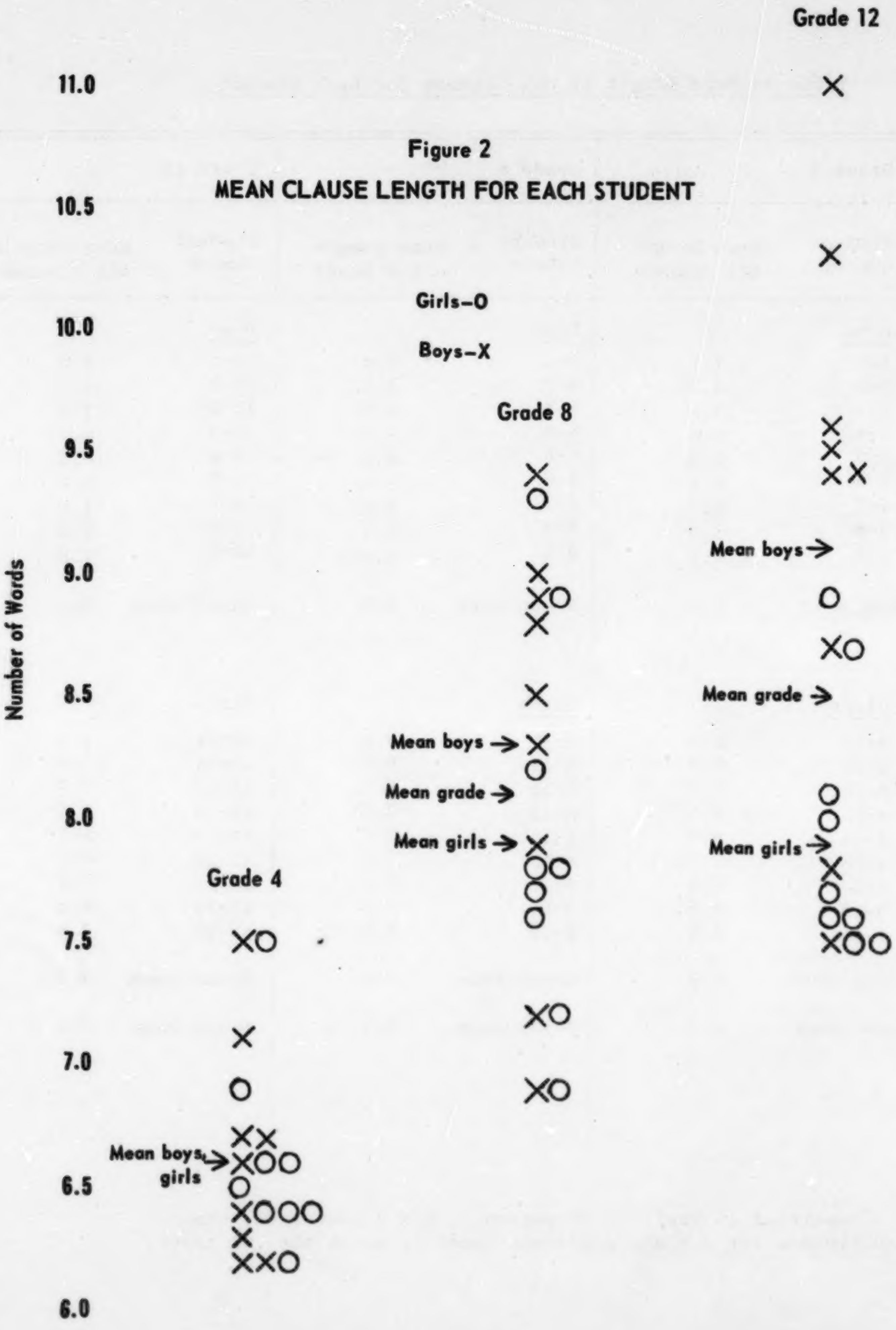


Figure 2

MEAN CLAUSE LENGTH FOR EACH STUDENT

books and working hard" she comments "...predicates containing two or more participles or complementary infinitives after a single auxiliary were counted as two predicates (p. 411)." On the next page she indicates that what are counted as predicates are counted as clauses.

In this study whole clauses rather than predicates are used in computing what is called the subordination ratio or index. A decision to count full verbs coordinated after the auxiliary verb, as did LaBrant, would leave unsettled the question of whether to count twice two predicates coordinated before the auxiliary, as in the sentence "I am studying books and will continue to work hard."

Furthermore it is difficult to see any justification, when one is searching for a measure of language maturity, to count the total number of predicates appearing both singly and coordinated, instead of counting the total number of subjects, for instance, appearing both singly and coordinated. There might perhaps be some justification if it were shown that coordinated finite verb phrases increase with maturity whereas coordinated subjects, or objects, or predicate adjectives do not.

To ascertain whether there might be any such justification, a tabulation was made of the number of subjects, of finite verb phrases, and of certain other structures which were coordinated by the different grades. The results are shown in Table 5. There three items coordinated together count as three items.

The results certainly provide no justification. In fact, counting coordinated finite verb phrases appears to handicap the procedure, for in these writings they decrease instead of increasing with maturity. They would serve to counteract some of the gain.

Table 5 The Number Of Certain Structures Coordinated By Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Subjects	62	84	146	67	37	104	29	43	72
Direct Objects	78	58	136	82	46	128	46	93	139
Objects of Prep. (not modifying nouns)	16	24	40	86	44	130	20	51	71
Indirect Objects	-	2	2	-	-	-	-	2	2
Predicate Nominals	14	14	28	32	20	52	10	22	32
Total of nominals listed	170	182	352	267	147	414	105	211	316
Finite verb phrases	192	181	373	197	166	363	133	124	257
Predicate Adjectives	6	2	8	53	6	59	22	25	47
Other	7	19	26	49	44	93	42	26	68
Total all items			759			929			688

The number of subordinate clauses written by each student was divided by the total number of clauses and written as a percent. The results are presented in Table 6. The ratio does increase for each grade: it is, for fourth, 22.2%; for eighth, 28.8%; for twelfth, 40.1%. These figures are higher than those reported for comparable ages by LaBrant, perhaps for the reason previously mentioned.

But the subordination ratio is not a very satisfactory index for individuals. As with the other two indexes studied so far there is extensive over-lapping among individuals in the three grades. Fourteen out of eighteen fourth graders over-lap eighth graders. This is shown in Figure 3.

A More Valid Large Unit

In view of the fourth graders' tendency to write too many *and's*, not enough periods, and occasional sentence fragments, it would be interesting to know what we might perceive if only we could be free from such distorting factors.

An investigator could ignore the student's punctuation. He could also ignore the student's coordinating conjunctions between main clauses. If he filtered out those two things, what remained would still be as grammatical as it was before. He would not be aware of fragments any longer. At this stage the language would extend as unbroken as the last chapter of Joyce's *Ulysses*.

The investigator could then cut up this connected discourse into the shortest segments which it would be grammatically allowable to write with a capital letter at one end and a period or question mark at the other, leaving no fragment as residue. Each segment would contain one main clause, which might or might not have a noun clause or adjective clause

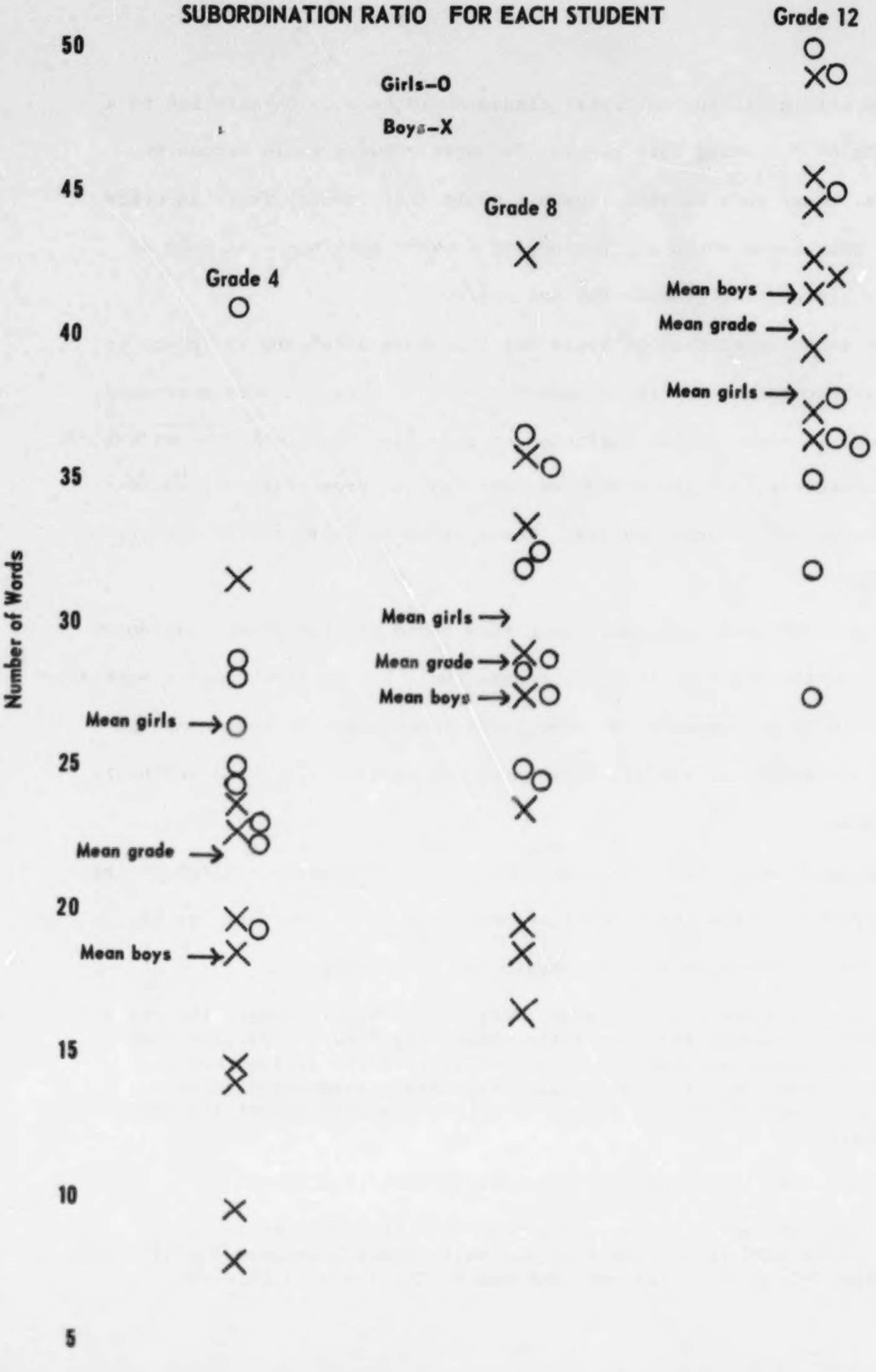
Table 6--Ratio Of Subordinate Clauses Divided By All Clauses For Each Student

Grade 4		Grade 8		Grade 12	
Student number	Ratio in %	Student number	Ratio in %	Student number	Ratio in %
Boys		**Boys**		**Boys**	
4-1	7.9	8-1	27.6	12-1	39.6
4-2	31.3	8-2	16.6	12-2	36.5
4-3	14.2	8-3	23.3	12-3	42.5
4-4	9.8	8-4	19.6	12-4	42.1
4-5	19.9	8-5	18.5	12-5	41.7
4-6	22.9	8-6	35.4	12-6	44.6
4-7	14.0	8-7	42.9	12-7	47.0
4-8	18.3	8-8	29.0	12-8	37.2
4-9	23.6	8-9	33.3	12-9	45.7
Group mean	18.3	Group mean	27.4	Group mean	41.8
Girls		**Girls**		**Girls**	
4-10	23.0	8-10	25.0	12-10	37.9
4-11	26.5	8-11	36.5	12-11	45.0
4-12	19.2	8-12	32.1	12-12	35.1
4-13	41.0	8-13	35.8	12-13	36.2
4-14	22.8	8-14	32.3	12-14	47.0
4-15	28.2	8-15	24.8	12-15	36.8
4-16	25.0	8-16	28.4	12-16	27.8
4-17	24.5	8-17	27.7	12-17	50.0
4-18	28.1	8-18	28.6	12-18	32.0
Group mean	26.5	Group mean	30.1	Group mean	38.7
Grade mean	22.2	Grade mean	28.8	Grade mean	40.1

As a result of an analysis of variance, 2 x 3 factorial, the significance was found to be for grade at the .01 level and for interaction of sex and grade at .05 level.

Figure 3

SUBORDINATION RATIO FOR EACH STUDENT



embedded within it. Any adverbial clause would have to be attached to a preceding or following main clause. Two main clauses would become two segments. These cuts between segments would fall exactly where an overzealous grammarian would put periods if he were putting in as many as possible, respecting grammar but not style.

As a matter of fact it would not have been necessary to ignore or delete any coordinators. Those coordinators, if they had been preserved, would now all stand at the beginning of segments. Twentieth century writers allow themselves to begin sentences that way, so preserving all coordinators would not be ungrammatical. These segments would all be miniature sentences.

Segments containing only one clause would be like simple sentences. Segments containing more than one clause would all be like complex sentences. There would be no compound sentences, but there might be some compound-complex sentences, for coordinators between subordinate clauses would all go untouched.

As an example, here is a theme as it was originally written by the fourth grader who had the longest average sentences. The theme is 68 words long. It contains eleven clauses but no periods.

> I like the movie we saw about Moby Dick the white whale the captain said if you can kill the white whale Moby Dick I will give this gold to the one that can do it and it is worth sixteen dollars they tried and tried but while they were trying they killed a whale and use the oil for the lamps they almost caught the white whale

Here is the same theme cut into segments as described above:

> I like the movie we saw about Moby Dick the white whale/ The captain said if you can kill the white whale Moby Dick I will give this gold to the one that can do it/ (and) It is worth

> sixteen dollars/ They tried and tried/ (but) While they were trying they killed a whale and use(d) the oil for the lamps/ They almost caught the white whale.

The first segment has a main clause and an adjective clause. The complicated second has a main clause containing a noun clause which contains, in turn, both an _if_ clause and an adjective clause. The third has only a main clause. The fourth has a main clause containing coordinate verbs. The fifth has a main clause with coordinate predicates and an adverb clause. The sixth has one clause.

The reason these segments are theoretically interesting is that they preserve all the subordination of the student's original sentences and also the internal coordination but are free of the coordination which was mainly a rhetorical grouping signal over-used. Studies in transformational grammar have shown that conjoining occurs at different stages in the generative process. The kind of coordination here eliminated must appear at a very late stage in the rules after the internal shape of the conjoined sentences is already fixed.

All the writings in this study were segmented in the fashion described above. The average length of such segments for each student was then calculated. These averages appear in Table 7. They are 8.6, 11.5, 14.4. In percentages the increase is from 60% to 80% to 100%. The increase is steady over the two halves of the time span.

These theoretically interesting units thus turn out to have practical value. For these writings they provide the best index of maturity yet discussed. They are a better index than the subordination ratio, the length of clauses or the length of sentences.

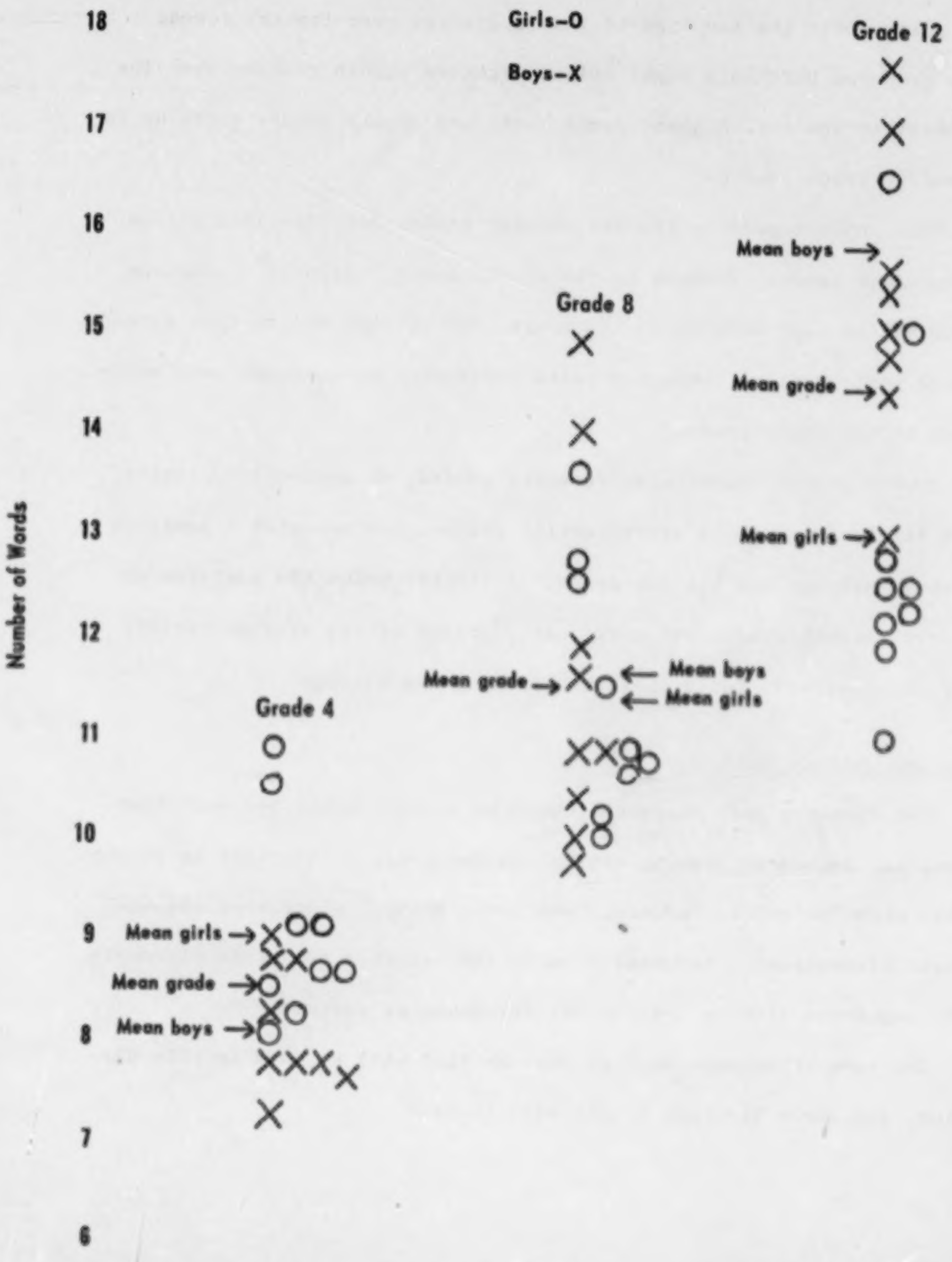
Table 7--Mean Length Of All T-units For Each Student

Grade 4		Grade 8		Grade 12	
Student number	Mean length all T-units	Student number	Mean length all T-units	Student number	Mean length all T-units
Boys		**Boys**		**Boys**	
4-1	7.8	8-1	10.9	12-1	15.6
4-2	9.0	8-2	10.4	12-2	14.8
4-3	8.7	8-3	11.9	12-3	13.0
4-4	7.2	8-4	11.6	12-4	15.0
4-5	7.8	8-5	10.0	12-5	17.6
4-6	8.3	8-6	14.0	12-6	17.0
4-7	7.8	8-7	14.8	12-7	19.6
4-8	7.7	8-8	9.9	12-8	15.4
4-9	8.7	8-9	10.9	12-9	14.4
Group mean	8.1	Group mean	11.6	Group mean	15.8
Girls		**Girls**		**Girls**	
4-10	8.1	8-10	10.2	12-10	12.2
4-11	9.1	8-11	10.9	12-11	12.5
4-12	8.5	8-12	13.6	12-12	11.9
4-13	10.9	8-13	12.7	12-13	12.5
4-14	8.2	8-14	11.5	12-14	16.5
4-15	10.5	8-15	10.0	12-15	12.8
4-16	8.6	8-16	10.8	12-16	12.3
4-17	8.6	8-17	10.7	12-17	15.0
4-18	9.1	8-18	12.6	12-18	11.0
Group mean	9.0	Group mean	11.4	Group mean	13.0
Grade mean	8.6	Grade mean	11.5	Grade mean	14.4

As a result of analysis of variance, 2 x 3 factorial, the significance was found to be for grade at .01 level.

Figure 4

MEAN TERMINABLE UNIT LENGTH FOR EACH STUDENT



As shown on Figure 4, this index separates the three grades more distinctly than do the other indices shown on the previous Figures, 1, 2, and 3. Here, only the two highest fourth graders over-lap the lowest eighth graders. Here only eight out of eighteen eighth graders over-lap the lowest in the next highest grade. Only one eighth grader comes up to the twelfth grade average.

This index separates the two younger grades more distinctly than the two older grades. Perhaps in the fourth grade, children's language development is kept uniform by their age, but as they mature they spread out more individually. Perhaps a valid index must acknowledge some over-lapping in the upper grades.

Fourth grader number six, recently quoted, whose sentence length placed him towering above every twelfth grader, now occupies a position just above average for his own grade, distinctly below the position of the lowest eighth grader and quite out of sight of the average twelfth grader. One secretly feels that this is where he belongs.

A Name For The New Unit

The segments just discussed could be called "miniature sentences," or "minimal sentences," using minimal in the sense of shortest in length. Or they might be called "minimal terminable units," since they are the shortest grammatically terminable units into which a connected discourse can be segmented without leaving any fragments as residue.

The term terminable unit is the one that will be used in this discussion. For short the term T-unit will be used.

These units are in a sense re-punctuated sentences. But the rules for the re-punctuating are sufficiently formal and so widely understood among grammarians that one investigator's segmenting ought to be verifiable by a second investigator.

The Lengthening Of Single-Clause And Multi-Clause T-Units

Summarizing language development studies up to 1954, McCarthy remarks "whatever increase in sentence length occurs at higher age levels is brought about largely through the addition of more subordinate clauses (p. 551)."

It is questionable whether the length of sentences as punctuated by fourth graders is a matter of any significance. However, if we alter McCarthy's hypothesis to make it apply to T-units rather than sentences, then it is still true that growth is "largely" of the sort mentioned, as will now be shown. However, it can also be shown that the increase is not entirely of that sort.

Let us separate the single-clause T-units -- (those with only a main clause like a simple sentence) -- from the multi-clause T-units -- (those with a main clause plus one or more dependent clauses like a complex sentence). Let us look to their growth separately.

If we figure the average length of the multi-clause T-units for the three grades we find that the average does increase substantially for each older grade. The three averages are 13.6 words, 16.2 words, 18.4 words: in percents, 74%, 88%, 100%. (Table 8)

We would expect this from what we have already seen. Already we have seen that the subordination ratio increases for the three grades. That

Table 8--Mean Length of Multi-clause T-units For Each Student

Grade 4		Grade 8		Grade 12	
Student number	Mean length	Student number	Mean length	Student number	Mean length
Boys		Boys		Boys	
4-1	22.0	8-1	14.8	12-1	18.8
4-2	12.8	8-2	12.9	12-2	21.2
4-3	13.8	8-3	14.7	12-3	17.7
4-4	16.5	8-4	19.2	12-4	18.5
4-5	12.1	8-5	17.7	12-5	21.2
4-6	14.5	8-6	17.7	12-6	22.5
4-7	12.1	8-7	18.3	12-7	24.1
4-8	13.1	8-8	13.5	12-8	20.8
4-9	13.5	8-9	14.9	12-9	18.0
Group mean	14.6	Group mean	16.0	Group mean	20.3
Girls		Girls		Girls	
4-10	10.7	8-10	17.3	12-10	16.3
4-11	12.3	8-11	14.3	12-11	19.1
4-12	12.0	8-12	19.9	12-12	14.8
4-13	13.0	8-13	16.5	12-13	15.2
4-14	12.7	8-14	14.5	12-14	19.6
4-15	16.3	8-15	16.7	12-15	17.9
4-16	12.0	8-16	15.5	12-16	15.6
4-17	12.0	8-17	14.7	12-17	16.6
4-18	12.8	8-18	18.6	12-18	14.1
Group mean	12.6	Group mean	16.4	Group mean	16.7
Grade mean	13.6	Grade mean	16.2	Grade mean	18.4

As a result of analysis of variance, 2 x 3 factorial, the significance was found to be for grade at the .01 level and for sex and for interaction of sex and grade at the .05 level.

That means that the average multi-clause T-unit for successively older grades has more dependent clauses in it. The T-units of course will be longer unless the clauses which are the parts should become progressively shorter, and already we know they do not. The clauses do not shorten; they lengthen a little.

In addition to this growth factor we can now investigate a second. We can find out whether these multi-clause T-units, with their increasing length, constitute a greater proportion of the writing of older students. We would expect that they did, and they do. In fourth grade writing, multi-clause T-units constitute 37% of all T-units; for eighth grade the percentage is 46%; for twelfth, 63%.

Both factors -- the increasing length of multi-clause T-units, and the increasing predominance of these lengthening units -- contribute to the fact that, as McCarthy says, "increase in sentence length (more significantly, T-unit length) occurs at higher age levels ... through the addition of more subordinate clauses."

Now the question can be asked: Is the growth hypothesized by McCarthy the only kind *of growth in length of average T-units? Or do older* students write longer T-units even when they do not use subordinate clauses? To answer that question we now return to the single-clause T-units. We find that their average length for fourth graders is 7.2 words; for eighth graders, 9.3 words; for twelfth, 10.6 words; in percents the change is from 68% to 88% to 100%. (Table 9)

If we take these last figures, the percentages indicating the length of single-clause T-units for the three grades, and compare them with the

Table 9--Mean Length of Single-clause T-units For Each Student

Grade 4		Grade 8		Grade 12	
Student number	Mean length of single-clause T-units	Student number	Mean length of single-clause T-units	Student number	Mean length of single-clause T-units
Boys		Boys		Boys	
4-1	6.4	8-1	9.2	12-1	12.1
4-2	6.8	8-2	9.9	12-2	9.4
4-3	7.8	8-3	10.8	12-3	8.7
4-4	6.5	8-4	9.9	12-4	11.3
4-5	6.5	8-5	8.6	12-5	13.2
4-6	6.3	8-6	11.7	12-6	10.8
4-7	7.0	8-7	10.7	12-7	13.5
4-8	6.5	8-8	7.5	12-8	11.7
4-9	7.2	8-9	8.2	12-9	9.1
Group mean	6.8	Group mean	9.6	Group mean	11.1
Girls		Girls		Girls	
4-10	7.3	8-10	8.2	12-10	8.9
4-11	7.7	8-11	8.2	12-11	9.2
4-12	7.7	8-12	11.2	12-12	9.8
4-13	8.6	8-13	9.7	12-13	10.2
4-14	6.8	8-14	9.9	12-14	12.5
4-15	7.8	8-15	7.1	12-15	9.4
4-16	7.4	8-16	8.5	12-16	10.9
4-17	7.1	8-17	8.7	12-17	11.5
4-18	7.4	8-18	9.1	12-18	9.2
Group mean	7.5	Group mean	9.0	Group mean	10.2
Grade mean	7.2	Grade mean	9.3	Grade mean	10.6

As a result of an analysis of variance, 2 x 3 factorial, the significance was found to be for grade at the .01 level.

earlier percentages for multi-clause T-units, the two sets are remarkably close. One set is 74%, 88%, 100%. The other is 68%, 88%, 100%. The conclusion must be, then, that the increase in length achieved by adding more clauses is very closely paralleled by an increase achieved by adding non-clauses. The hypothesis mentioned above will not explain what we have just observed and concluded.

This conclusion should not surprise a grammarian, especially a transformational grammarian. Any student of the language knows that often two sentences can be combined so that one becomes a clause or, instead, becomes a non-clause, perhaps a phrase. "He arrived home" plus "He put the key in the lock" can be combined to produce a two-clause T-unit "When he arrived home he put the key in the lock." Or the two can be combined to produce a single-clause T-unit, "Arriving home, he put the key in the lock." The line between transformations that produce clauses and those that produce non-clauses is thin, and in some respects not important. Non-clauses have been neglected in language development studies.

We can now speculate in this way: From the fact that T-units grow longer in the hands of older students we might hypothesize that successively older students use more sentence-combining transforamtions per T-unit. Some will produce clauses and some non-clauses. If more are used per T-unit, then the chances are that a certain percentage will produce clauses, so more clauses will be used per T-unit by older students. This we have found to be true. But the chances are also that some of these transformations will produce non-clauses, and when none are clauses we will continue to have single-clause T-units, but they will be longer T-units for older students. This also we have just found to be true. Furthermore, as more transformations are used per T-unit, the chances of none being clauses declines, so we would expect the proportion of single-clause T-units to decline also. We have just seen that it does. One last inference: if the number of sentence-combining transformations in general increases, some producing clauses but some non-clauses, we would expect the proportion of 2-clause, 3-clause, 4-clause T-units to increase with some symmetry.

Before we proceed to examine more directly the number of sentence-combining transformations actually used within each T-unit, we shall proceed now to see whether the proportion of 2-clause, 3-clause, 4-clause units does indeed increase with some symmetry in successively older grades.

How Many Clauses In Multi-clause T-units?

So far we have seen that T-units get longer with successively older grades and that the proportion of multi-clause T-units to single-clause T-units increases also. We can refine our description of multi-clause T-units if we represent separately the number of clauses in 2-clause, 3-clause, 4-clause, and 5-clause T-units. That representation appears in Figure 5.

A Profile Of All T-units

The averages given so far are statistically convenient and succinct, but a fuller picture of T-unit lengths characteristic of each grade can be seen from Figure 6 and Table 10 showing the number of such units of each length from shortest to longest.

Characteristic of fourth graders is a high bulge to the left indicating a considerable number of T-units less than 9 words long. The fourth graders'

Figure 5

MEAN NUMBER OF CLAUSES IN ONE CLAUSE, TWO CLAUSE THREE CLAUSE, ETC. TERMINABLE UNITS FOR EACH GRADE

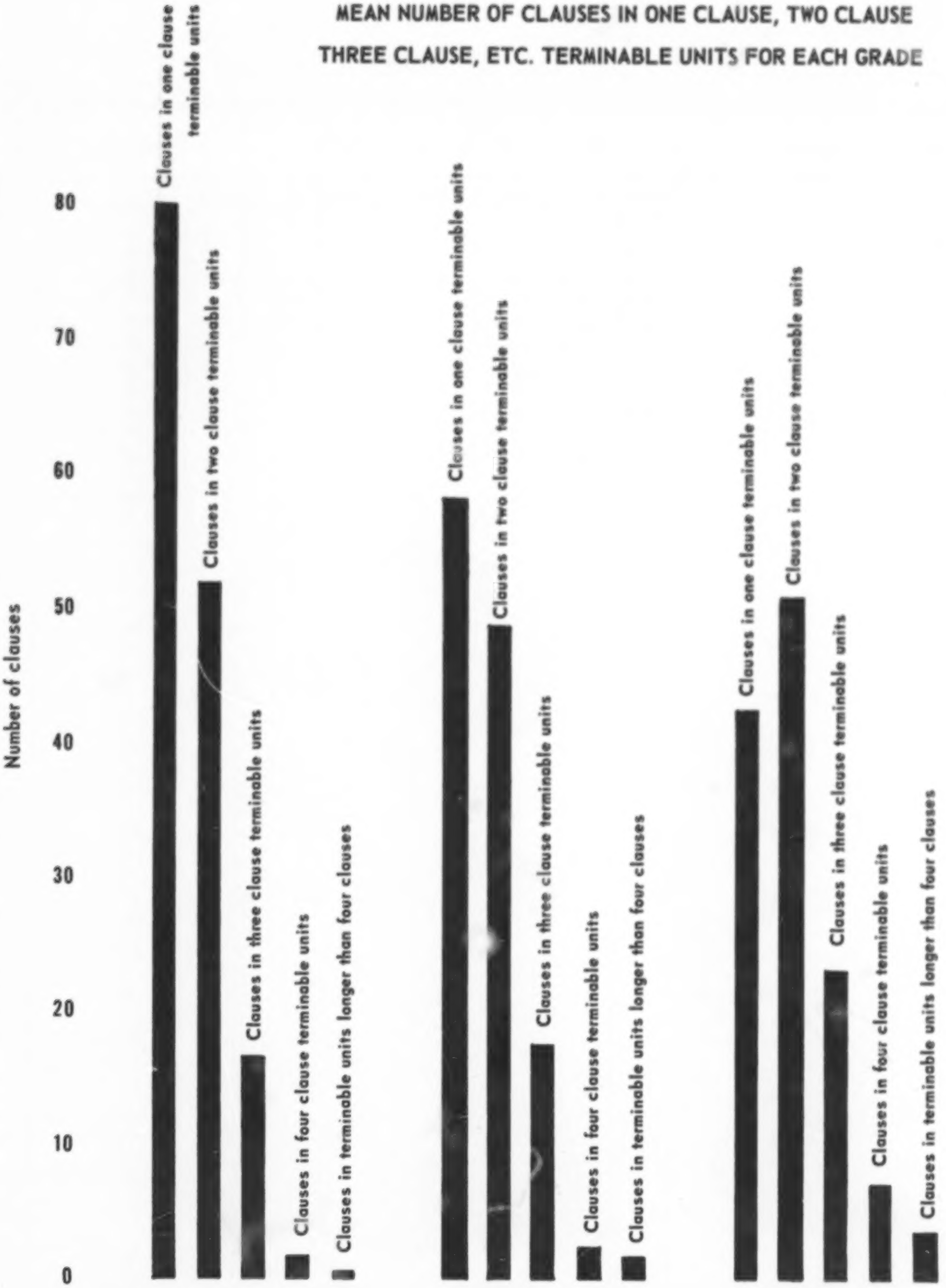


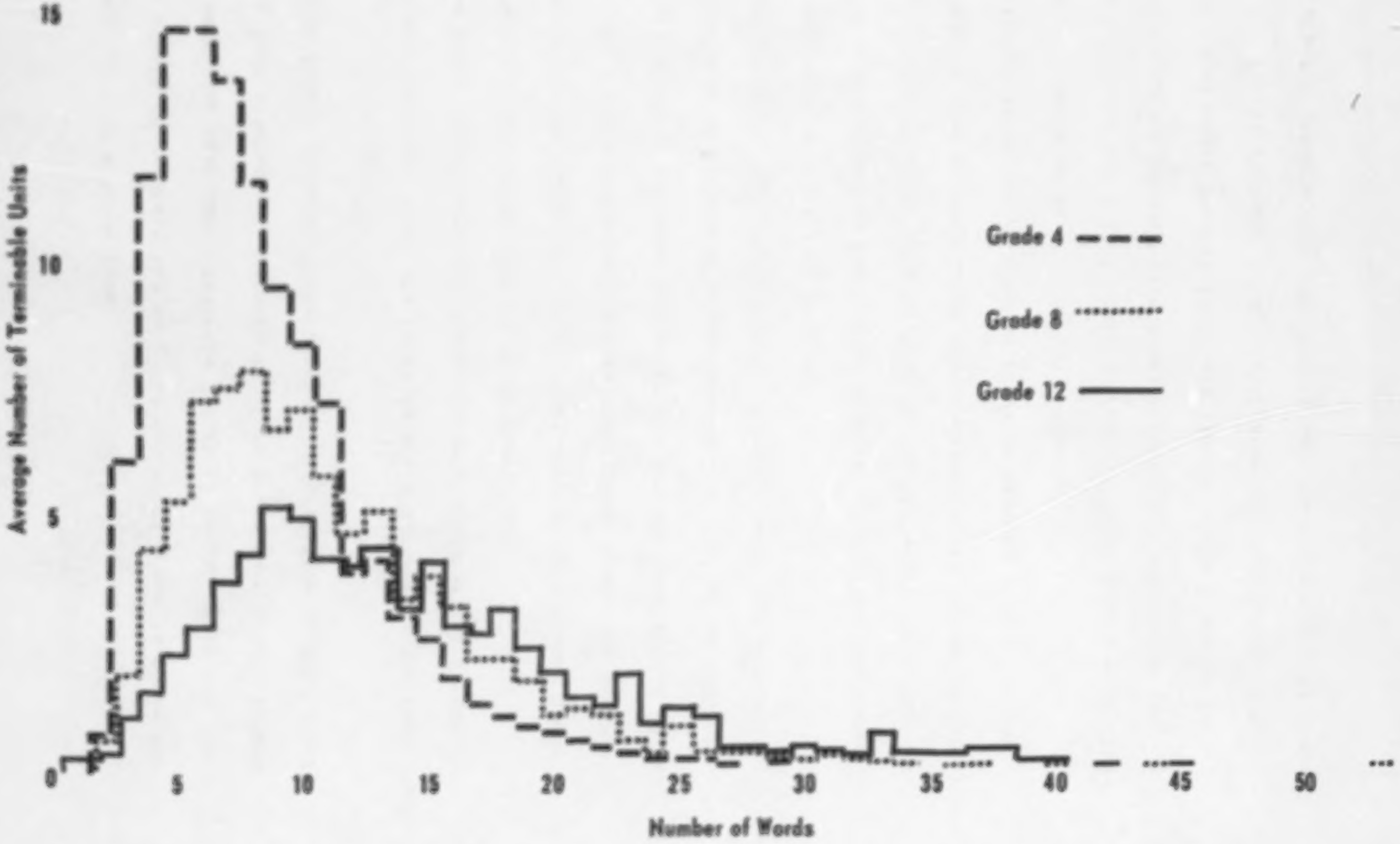
Table 10 Mean Number of T-units of Each Length for Each Grade

Length in words	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
1							.1	.1	.1
2	.7	1.0	.8	.2	.9	.6	.3	.3	.3
3	7.3	4.8	6.1	1.4	2.4	1.9	.7	1.4	1.0
4	14.7	8.7	11.7	3.4	4.8	4.1	1.1	2.1	1.6
5	18.9	10.2	14.6	4.0	6.7	5.3	1.7	2.9	2.3
6	16.8	12.2	14.5	6.9	7.7	7.3	1.9	3.4	2.7
7	14.2	13.4	13.8	8.0	6.8	7.4	2.8	4.9	3.8
8	12.0	11.2	11.6	8.2	7.4	7.8	3.0	6.1	4.5
9	9.0	10.0	9.5	6.6	6.8	6.7	4.0	6.7	5.3
10	7.1	8.3	7.7	8.5	6.2	7.3	4.1	6.0	5.0
11	6.9	6.7	6.8	6.1	5.8	5.9	3.1	5.3	4.2
12	2.9	5.0	3.9	4.2	5.2	4.7	3.0	5.1	4.1
13	3.3	4.8	4.1	5.2	4.9	5.1	3.9	5.0	4.4
14	2.3	3.6	3.0	4.1	2.4	3.3	3.4	3.2	3.3
15	2.3	2.8	2.6	4.3	3.3	3.8	3.6	4.4	4.0
16	1.1	2.8	1.9	3.7	2.7	3.2	2.8	3.0	2.9
17	1.3	1.1	1.2	2.2	2.7	2.4	3.7	2.0	2.8
18	.9	1.1	1.0	2.1	2.8	2.5	3.0	3.1	3.1
19	.6	1.2	.9	2.2	1.4	1.8	2.4	1.9	2.2
20	1.2	.6	.9	1.3	.7	1.0	2.3	1.1	1.7
21	.3	.7	.5	.8	1.7	1.2	1.6	1.4	1.5
22	.3	.3	.3	1.0	1.1	1.0	1.8	.9	1.3
23	.1	.2	.2	.3	.7	.5	1.6	2.2	1.9
24	.1	.2	.2	.2	.4	.3	1.2	.6	.9
25	.0	.2	.1	.7	1.0	.8	1.1	1.1	1.1
26	.1	.2	.2	.4	.3	.4	1.0	1.0	1.0
27	.1	.1	.1		.9	.4	.4	.2	.3
28				.4	.4	.4	.2	.3	.3
29		.1		.1	.3	.2	.3	.1	.2
30				.2	.1	.2	.1	.4	.3
31				.2	.2	.2	.6	.1	.3
32				.2	.2	.2	.2	.2	.2
33				.2	1	.2	.4	.6	.5
34				.1			.4		.2
35		.1					.1	.1	.1
36		.1		.1			.1		
37							.3	.1	.2
38							.6		.3
39							.3		.2
40					.1		.1		
41								.1	
43							.1	.1	.1
44					.1			.1	
46							.1		
53				.1					

Figure 6

THE MEAN NUMBER OF TERMINABLE UNITS OF EACH LENGTH, FOR THREE GRADES

(Average number of terminable units/number words)



favorite T-unit is 5 or 6 words long.

On the eighth grade chart the bulge is not so high and is moved to the right, indicating that their favorite T-unit is not so short and their favoritism is less pronounced. Furthermore, they write more middle length T-units than do fourth graders. Their range of distribution is more nearly even.

On the twelfth grade chart the bulge is still farther to the right and is still less high, indicating that these students prefer still longer T-units and are still less pronounced in their favoritism.

We can notice one thing more if we chart separately for each grade the multi-clause T-units and single-clause T-units. By comparing Figures 7 and 8 which are drawn to the same scale, we see now that the grades differ more pronouncedly in their use of single-clause T-units than in their use of multi-clause T-units, and, furthermore, in their short and middle-length T-units, rather than in their long T-units.

There is a difference in their long T-units, of course. The number of T-units more than 20 words long written by the three grades is 31, 117, 204. The number of long T-units would make a fairly valid index of maturity (Table 11), though it is not so good an index as average length, or the number of short T-units, as we will see in a moment.

We can summarize the T-unit profiles for the three grades with these figures. Fourth graders produce 1316 T-units less than nine words long. Almost all of these short T-units (91%) are single-clause T-units. In contrast to the fourth graders' 1316, eighth graders produce only 616, and twelfth graders produce only 295. Taking the twelfth grade performance

Figure 7

THE MEAN NUMBER OF SINGLE-CLAUSE TERMINABLE UNITS OF EACH LENGTH,

FOR THREE GRADES

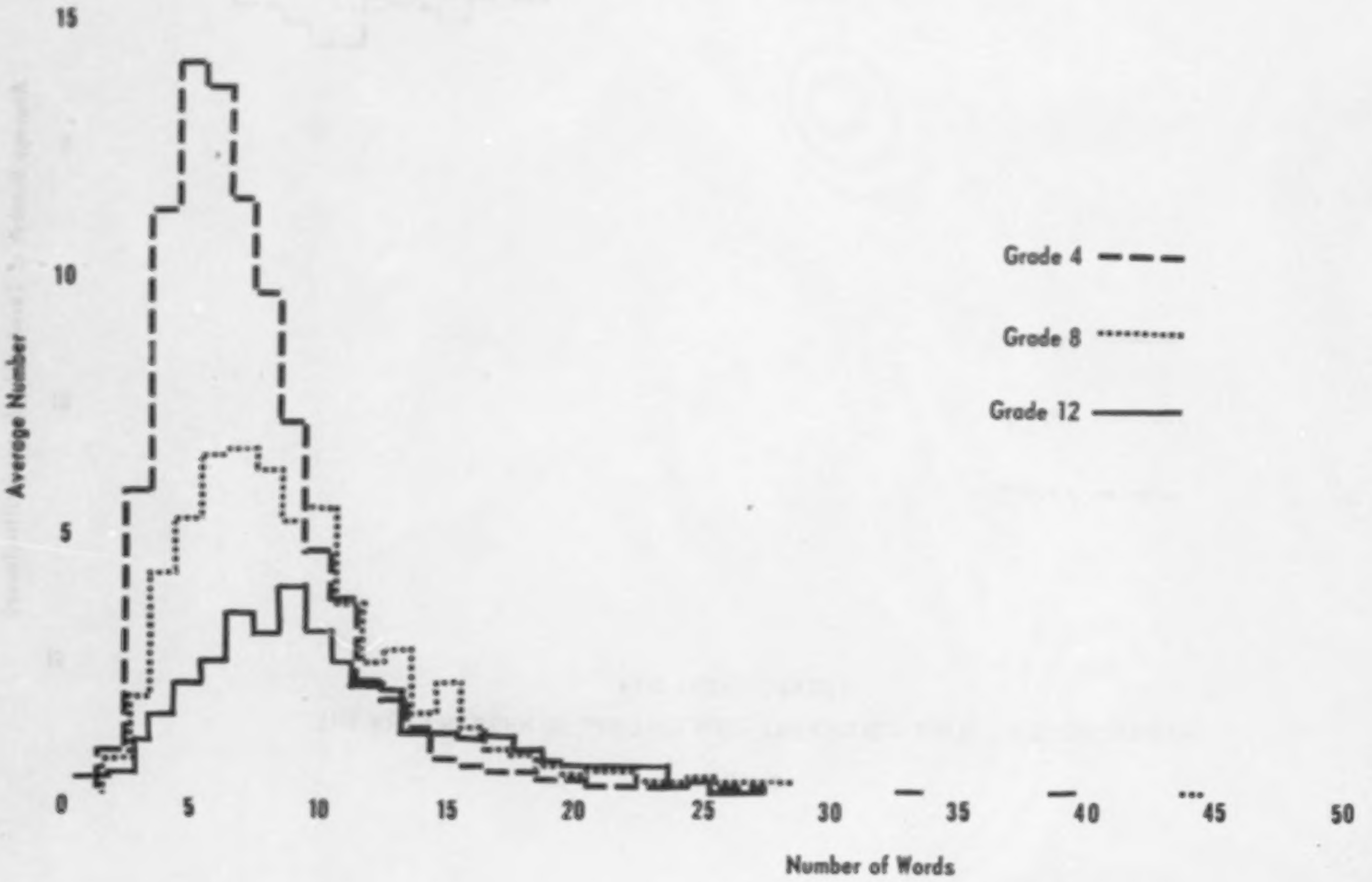


Figure 8

THE MEAN NUMBER OF MULTI-CLAUSE TERMINABLE UNITS OF EACH LENGTH, FOR THREE GRADES

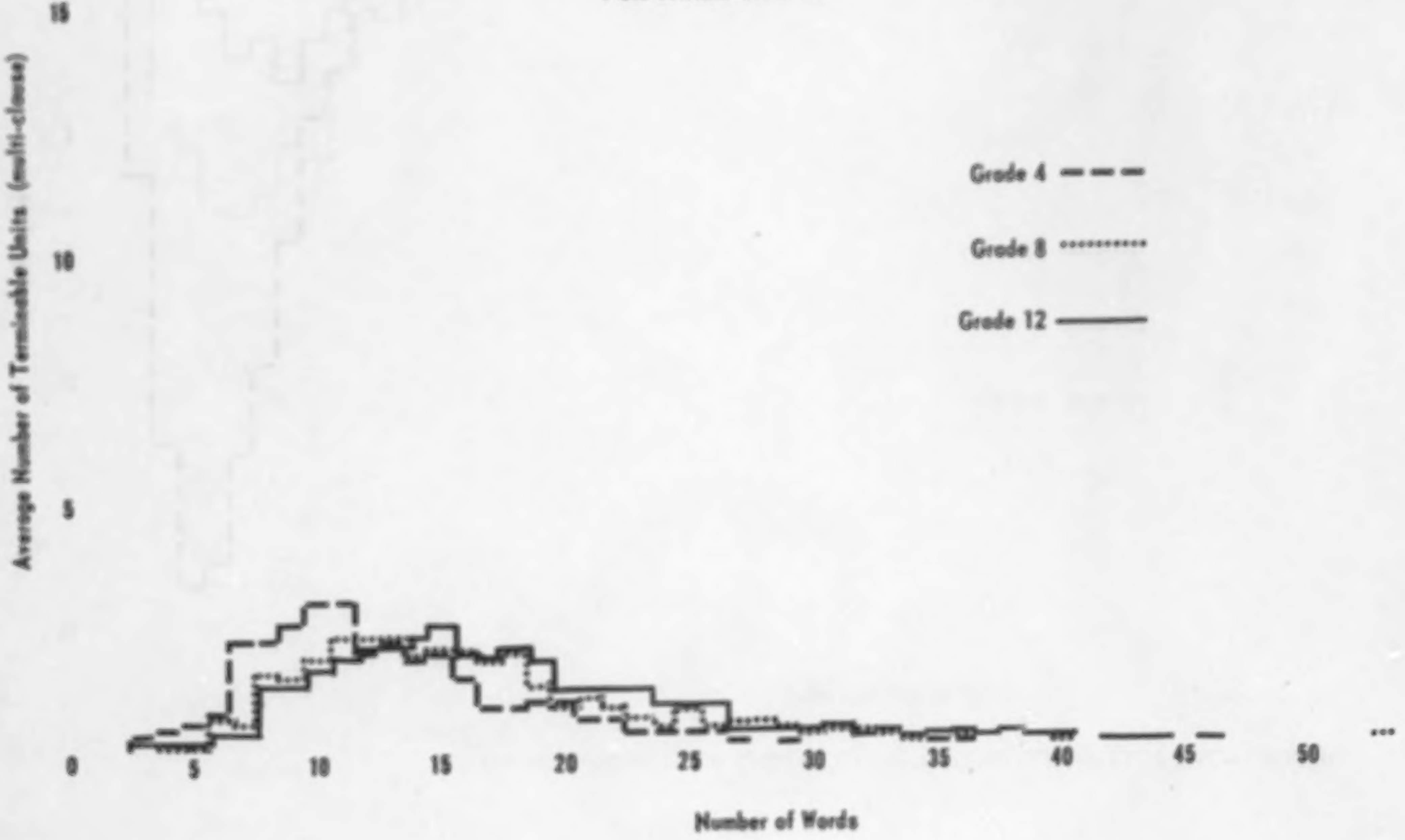


Table 11--Number of T-units Longer Than 20 Words For Each Student

Grade 4		Grade 8		Grade 12	
Student number	Number of T-units	Student number	Number of T-units	Student number	Number of T-units
Boys		**Boys**		**Boys**	
4-1	0	8-1	4	12-1	13
4-2	2	8-2	3	12-2	8
4-3	3	8-3	2	12-3	11
4-4	0	8-4	5	12-4	9
4-5	1	8-5	4	12-5	18
4-6	1	8-6	11	12-6	11
4-7	0	8-7	13	12-7	14
4-8	1	8-8	1	12-8	19
4-9	2	8-9	4	12-9	13
Girls		**Girls**		**Girls**	
4-10	3	8-10	7	12-10	11
4-11	2	8-11	7	12-11	10
4-12	3	8-12	7	12-12	3
4-13	7	8-13	9	12-13	9
4-14	2	8-14	8	12-14	19
4-15	4	8-15	5	12-15	13
4-16	0	8-16	6	12-16	8
4-17	0	8-17	7	12-17	12
4-18	0	8-18	14	12-18	3
Grade Total	31	Grade Total	117	Grade Total	204

as 100%, the proportion for the three grades in order is 445%, 209% and 100%. The number of short T-units would provide a fairly valid index of maturity (See Table 12).

If instead of counting the number of units themselves, we figure the number of words contained in such short units, we find it to be 43% of the total writing for fourth graders, 21% for eighth and 10% for twelfth: roughly a half, a fifth, and a tenth. In other words, roughly half the writing of fourth graders is done in T-units not longer than eight words, whereas twelfth graders do only a tenth of their writing in units that short.

If one were looking for an objective explanation of why an older person feels that "fourth graders use so many short sentences," he might put his finger on this fact. It is not the sentences that are short, we have seen; but the T-units are.

The Contingency Coefficients Of Four Indexes

To determine whether a student's sentence length, clause length, subordination ratio or T-unit length was the best predictor of his grade level, a statistical analysis was made. Each student's score on each of those four variables was subjected to a chi-square analysis. A contingency coefficient was then calculated.

In order to arrive at the division of performance, the distribution scores were divided so that all students with scores equal to or greater than one standard deviation above the mean of the total group distribution were categorized as "high." Those with scores equal to or less than one standard deviation below the mean were categorized as "low." All others

Table 12--Number of T-units Shorter Than 9 Words For Each Student

Grade 4		Grade 8		Grade 12	
Student number	Number of T-units	Student number	Number of T-units	Student number	Number of T-units
Boys		Boys		Boys	
4-1	100	8-1	36	12-1	7
4-2	69	8-2	38	12-2	17
4-3	71	8-3	22	12-3	20
4-4	106	8-4	26	12-4	11
4-5	88	8-5	44	12-5	8
4-6	77	8-6	18	12-6	6
4-7	87	8-7	17	12-7	4
4-8	93	8-8	47	12-8	17
4-9	69	8-9	38	12-9	13
Group Total	760	Group Total	286	Group Total	103
Girls		Girls		Girls	
4-10	78	8-10	48	12-10	28
4-11	58	8-11	48	12-11	19
4-12	65	8-12	20	12-12	22
4-13	41	8-13	21	12-13	18
4-14	79	8-14	28	12-14	6
4-15	42	8-15	60	12-15	24
4-16	72	8-16	36	12-16	24
4-17	63	8-17	42	12-17	14
4-18	58	8-18	27	12-18	37
Group Total	556	Group Total	330	Group Total	192
Grade Total	1316	Grade Total	616	Grade Total	295

were categorized as "average."

The chi-squares were found to be significant at the .01 level, and the contingency coefficients, as shown below, indicate that the best of the four as a predictor of grade is mean T-unit length. Second best is mean clause length. Third best is subordination ratio. Poorest is mean sentence length.

	x^2	contingency coefficient
Mean sentence length	17.03	.489
Subordination ratio	20.30	.523
Mean clause length	33.10	.616
Mean T-unit length	50.35	.694

A Summary Of T-unit Findings

So far this study indicates that

(1) T-unit length is a more valid index of maturity in writing-at least in the early grades--than is (a) sentence length or (b) clause length of (c) the subordination ratio.

(2) Older students write fewer short T-units and fewer single-clause T-units.

(3) Older students increase the length of many of their T-units by using more subordinate clauses as well as non-clauses.

(4) Older students increase the length of other T-units at roughly the same rate by adding non-clause structures.

(5) We would be led to expect the conclusions (2), (3), and (4) if we subscribed to the hypothesis that successively older

students use more and more of the transformations that convert sentences into subordinate clauses and also into non-clauses.

4. FINDINGS: SUBORDINATE CLAUSES WITHIN T-UNITS

Standard Procedure With Subordinate Clauses

Several investigators have found that older children write more subordinate clauses. Among them are LaBrant, Stormzand and O'Shea, Heider and Heider, Hoppes, Harrell, and Watts.

Several of these have gone on to sub-classify such clauses into noun, adjective and adverb types, and have reported the relative frequency of each type. Harrell has compared his own findings on this subject with the findings of LaBrant, Hoppes, Stormzand and O'Shea, Heider and Heider.

Several investigators have gone further and have sub-classified adverbial clauses into about eight categories of meaning and again have reported the relative frequency of each kind. Again Harrell has compared his own findings on this subject with those of two other investigators.

The next step taken by several has been to investigate the position of subordinate clauses with respect to some other element.

There would be little justification for yet another study to cover the same ground unless some new use were to be made of the findings. This study will cover much the same ground, though not exactly the same. A new use and a somewhat new interpretation will be made of those findings.

The new interpretation is this: following transformational procedures, subordinate clauses will be treated as transformed sentences embedded in, or attached to, other sentences to produce T-units. What has been called the standard procedure in language development studies has not included such treatment. The transformational approach has been used only in a few recent studies of the spoken English of much younger children.

The new use is this: several investigators have remarked that structures other than subordinate clauses are used to lengthen grammatical structures. But those writers usually have not investigated what those structures are. This study will investigate them. In order to talk about the nominals used in T-units it is well to know how many are clauses and how many are not. In order to talk about modifiers of nouns it is well to know how many are clauses and how many are not. In talking about modifiers of verbs it is well to notice how many are adverbial clauses and how many are not.

Actually subordinate clauses may have received their emphasis in previous studies at the expense of non-clausal elements. Non-clauses may be equally important.

Subordinate clauses are discussed here apart from non-clauses because to do so has been standard procedure. In any event, clauses must be discussed, and if they are discussed by themselves, they can then be referred to more briefly once non-clauses are taken up.

The Three Kinds Of Subordinate Clauses

In conventional terminology, clauses are structures with a finite verb as well as a subject. In transformational terminology, these verbs have a tense marker as well as a subject. For instance, the underlined words are considered a clause in the sentence "She told me I ought to keep quiet." But in the sentence "She told me to keep quiet" there is no subordinate clause. We might call to keep quiet a "near-clause."

Traditionally, subordinate clauses are classified into three subgroups: noun clauses, adjective clauses and adverb clauses. Noun clauses usually are direct objects after some verb like think, or say, or ask ("I thought (that) he would be here." "I asked who would be there.") Noun clauses occasionally appear as predicate nominals and subjects and in other positions which nouns occupy, as will be discussed later.

Adjective clauses always follow the nouns they modify. ("He's the one (that or who or whom) I told you about.") Adverbial clauses, in contrast to the other two kinds, are in most instances movable. That is, they can precede or follow or interrupt the main clause to which they are attached. ("When she comes, we'll leave." "We'll leave when she comes.") Clauses of comparison, however, are not movable, though they are commonly classed as adverbial.

Some Formal Differences Between Coordinated And Subordinated Clauses

Though the distinction between coordinate clauses and subordinate adverbial clauses is usually discussed in terms of semantics or meaning, it is not clear that any such distinction can be made. For is a coordinator, but it means the same as because, a subordinator. A clear distinction can be made, however, on purely formal grounds.

The meaning produced by subordination is not necessarily different from that produced by coordination. In the following pair of sentences the same meaning is conveyed, with no more than stylistic differences, whether a coordinator or subordinator is used: "Mother came home and I got punished"; "When Mother came home I got punished." The form, of course, is not the same for the two. A clause introduced by a subordinator can either precede or follow the main clause to which it is related. A clause introduced by a coordinator cannot precede the clause to which it is related;

it can only follow. Thus, it is English to say "I got punished when Mother came home," but it is not English to reverse the clauses in the other sentence so that it reads "And I got punished Mother came home."

A subordinator can relate its own clause either leftward or rightward to a different clause: that is why the subordinated clause is movable. However, a coordinator between main clauses relates its own clause always leftward to something else. That is why it is not movable.

There is a second formal difference between subordinators and coordinators. Though we have spoken, on several previous occasions, about coordinators between main clauses, we have meant, more strictly speaking, coordinators between T-units, for whole T-units are joined whether the T-units happen to be of the single clause or multi-clause variety. If a sentence begins "And when..." we understand that the and joins to the preceding T-unit both the "when-" clause and the main clause which must follow: in other words, the and joins the preceding T-unit to the following T-unit. Subordinators, in contrast, do not do that. They only relate their own clause, whatever it may contain, to another clause. They do not relate one whole T-unit to another.

A third formal difference is that in contemporary standard English a coordinator can come at the first of a sentence where it relates leftward to the preceding T-unit even across the sentence punctuation boundary. A subordinator, in contrast, never relates across a sentence punctuation boundary.

To summarize, then, (1) a subordinator relates its clause to another on either its left or right, whereas a coordinator relates its structure to another on its left; (2) A coordinator can relate even multi-clause T-units to each other, whereas subordinators relate only clauses to each other. (3) A coordinator at the first of a sentence relates leftward even across a sentence boundary, whereas a subordinator never subordinates across a sentence boundary.

Transformations To Produce Noun Clauses

There are two kinds of noun clauses. One is like an indirect question, the other like a statement of fact. The factive noun clause, introduced by _that_, or with _that_ deleted, appears in positions where a factive noun can occur. "She told me something" can be combined with "I ought to keep quiet" to produce "She told me (that) I ought to keep quiet." Here a clause does replace the noun _something_ as direct object, and in other sentences it can replace a noun as subject or predicate nominal, or object of a preposition.

The second kind of noun clause, instead of being an assertion, is in several respects like an indirect question. The sentence "She asked me something" can be combined with "Who went to the game" to produce "She asked me who went to the game." Again the clause replaces a noun.

Obviously when one sentence is transformed into a noun clause and is embedded within a second sentence, two T-units have become one longer one. If older students used more noun clauses, that fact would tend to increase the length of their T-units.

Noun Clauses For The Three Grades

Quoted conversation is ordinarily introduced by an expression like "He said..." In a sense the quotation is direct object of the transitive verb _say_. There is some reason, then, to tabulate direct discourse along with noun clauses.

Fourth graders, since they were writing about what people said and did, used a great deal of direct discourse. For the three grades it appeared 106, 43, 18 times.

Older students were more inclined to paraphrase what someone said. They also used the noun clause to talk about ideas and beliefs. They used indirect discourse or indirect questions, usually as direct objects after some verb like think or believe or ask. The three grades used noun clauses exclusive of direct discourse 186, 204, 353 times. In percentages the increase is 52%, 58%, 100%.

The increase of these latter noun clauses partly offsets the decrease in direct discourse so that the totals for the three grades are 292, 247, 371. (Table 12a)

Are Some Noun Clauses More Difficult Than Others?

One might suppose that it would be easier to produce factive noun clauses than indirect question noun clauses, for to transform a sentence into a factive clause requires no change except perhaps the addition of a that at the beginning. Producing an indirect question clause requires more extensive changes. An appropriate interrogative pronoun (or adverb) must be found, and if the interrogative is anything other than the subject, then the usual word order must be altered to put the interrogative first.

However, looking to the total for question clauses in Table 12a, and noting that fourth grade girls use more than any other group, one must doubt that the indirect question clause is difficult for fourth graders.

One might also speculate that it would be easier to use interrogative pronouns which were subjects than to use those which were non-subjects and

Table 12a Words Used to Introduce Noun Clauses by Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
that	11	28	39	23	31	54	102	76	178
Ø (deleted that)	32	40	72	27	38	65	26	60	86
(reason was...) because	-	-	-	2	3	5	-	-	-
(reason was...) so	-	-	-	-	-	-	1	-	1
Sub-total	43	68	111	52	72	124	129	136	265
Direct Discourse	30	76	106	8	35	43	6	12	18
Interrogative pronouns and adverbs									
what	9	22	31	15	11	26	22	12	34
whatever	-	1	1	-	-	-	-	-	-
how	-	6	6	7	9	16	3	7	10
if	7	10	17	-	3	3	8	2	10
whether	-	-	-	-	-	-	3	2	5
where	4	4	8	8	2	10	4	3	7
why	2	1	3	8	1	9	1	8	9
who	-	6	6	5	1	6	6	1	7
whoever	-	1	1	-	-	-	-	-	-
when	2	-	2	1	3	4	2	1	3
which	-	-	-	1	1	2	-	2	2
how long	-	-	-	1	1	2	-	-	-
how and what	-	-	-	-	-	-	-	1	1
how and why	-	-	-	1	-	1	-	-	-
where and how	-	-	-	1	-	1	-	-	-
Sub-total	24	51	75	48	32	80	49	39	88
Total	97	195	292	108	139	247	184	187	371

The number of noun clauses written by each student was subjected to an analysis of variance, 2 x 3 factorial. The significance for sex and also for grade was found to be at the .05 level.

which therefore required a change in the normal sentence word order. Thus "Who broke it" would be less difficult than "What he broke." However, the information given in Table 13 lends no support to this speculation. Fourth graders use the putatively more difficult positions as frequently as do older students.

Table 13 The Functions Of Interrogative Pronouns In Noun Clauses, For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Subject	4	10	14	5	5	10	8	5	13
Direct Object	3	14	17	10	5	15	14	7	21
Object of a Preposition*	-	2	2	3	-	3	1	1	2
Predicate Nominal	2	1	3	2	2	4	-	1	1
			36			32			37

*In every instance the object was separated from the preposition.

The Functions Of Noun Clauses Inside Main Clauses

The great majority of noun clauses are direct objects. However, the ability to use noun clauses in the other positions appears to be a mark of maturity. At least older students do so with increased frequency: 16, 45, 63. Table 14 gives further details.

Transformations To Produce Adjective Clauses

Some sentences containing an adjective clause can be regarded as the product of two sentences containing one nominal common to both. Thus "We recognized the car" plus "The car hit the dog" can be combined to produce

Table 14 Position of Noun Clauses Within Main Clauses, for Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Subject									
that or Ø, etc.	-	1	1	2	6	8	2	1	3
question clause	-	1	1	1	-	1	-	-	-
Object of preposition									
that or Ø	-	-	-	-	-	-	-	-	-
question clause	-	1	1	3	1	4	8	7	15
Predicate Nominal									
that or Ø or so or because	-	8	8	9	8	17	9	5	14
question clause	1	3	4	11	2	13	6	4	10
Other									
that or Ø	-	1	1	1	-	1	12	9	21
question clause	-	-	-	-	1	1	-	-	-
Sub-total									
that or Ø, etc.	-	10	10	12	14	26	23	15	38
question clause	1	5	6	15	4	19	14	11	25
Sub-total			16			45			63
Direct Object									
that or Ø	43	58	101	40	58	98	106	121	227
question clause	23	46	69	33	28	61	35	28	63
direct discourse	30	76	106	8	35	43	6	12	18
Total			292			247			371

a new sentence, "We recognized the car which hit the dog." In the second sentence the common nominal the car was replaced by an appropriate relative pronoun which and that whole structure was embedded in the first sentence immediately after the same nominal, the car, that was replaced by the relative pronoun.

Other sentences containing an adjective clause can be regarded as the product of two sentences containing, instead of a pronoun, an adverbial common to both. Thus, "He worked at the store" plus "We bought our groceries at the store" can be combined to produce a new sentence "He worked at the store where we bought our groceries." In the second sentence the common adverbial at the store was replaced by an appropriate relative adverb where which was then moved to the first of the structure. Then the whole structure was embedded in the first sentence immediately after the same adverbial that was replaced by the relative pronoun.

Obviously two sentences combined in this fashion will have the effect of replacing two T-units with a new and longer one. If older students should do more of this than younger ones, then their T-units would tend to be longer.

Adjectival Clauses For The Three Grades

The frequency of adjectival clauses does indeed increase from fourth to eighth and from eighth to twelfth grades. It more than doubles. The number of occurrences in fourth, eighth and twelfth grades is, respectively, 96, 144, 210; in percentages the increase is from 46% to 68% to 100%. The increase is about equal for the first and last halves of the eight-year time span. (Table 15)

Table 15 Words Used to Introduce Adjective Clauses by Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Relative pronouns									
Ø (deleted relative)	16	14	30	29	13	42	22	28	50
that	14	13	27	24	33	57	35	20	55
who	5	21	26	8	4	12	21	21	42
whom	-	-	-	-	-	-	1	-	1
whose	-	1	1	-	-	-	2	-	2
which	2	1	3	9	16	25	22	28	50
of which	-	-	-	-	-	-	1	-	1
in which	-	-	-	-	-	-	4	-	4
Sub-total			87			136			205
No. of different introducers			5			4			8
Relative adverbs									
where	3	2	5	3	2	5	3	-	3
when	2	1	3	-	1	1	1	-	1
while	1	-	1	1	-	1	1	-	1
(reason) why	-	-	-	-	1	1	-	-	-
Sub-total			9			8			5
Total			96			144			210

The number of adjective clauses written by each student was subjected to analysis of variance, 2 x 3 factorial. The significance was formed to be for grade at the .01 level.

Words Introducing Adjective Clauses

Table 15 lists the various relative pronouns and adverbs used to introduce adjective clauses. Three observations can be made.

One needs to recall that *that* is the most conversational of the relative pronouns, and is also the most versatile, as well as the oldest historically. It can be used for both animate and inanimate nouns. *Which*, on the other hand, is a relatively recent variant that can be used only for inanimate nouns. In view of those grammatical considerations, the frequency of *which* suggests that a student learns to use it in place of *that* during his school years. The frequency of *which* in the three grades is 3, 25 and 50.

A second observation is that *whom* is almost never used. It appeared just once, though as Table 16 shows, 173 relative pronouns served as objects of prepositions or objects of verbs. Some of those must have replaced animate nouns so that *whom* would have been allowable, yet in 172 cases out of 173, relative pronoun *who* or *that* or nothing was used instead. *Whom* was scarcely in the writing vocabulary of these students.

A third observation is that objects of prepositions are almost always separated from their prepositions. That is, students prefer "I know the store (*which*, *that*) he works in," not "I know the store in which he works." Though the three grades used relatives as objects of prepositions 45 times, they separated the object 40 times. The five occasions when the object was not separated occurred all on the papers of one student, a twelfth grader.

On an earlier occasion we noticed that the same thing is true of interrogative pronouns. All seven objects were separated from their prepositions.

Table 16 The Functions of Relative Pronouns in Adjective Clauses, for Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Subject	21	30	51	31	40	71	58	59	117
Direct Object	12	16	28	30	22	52	25	23	48
Object of preposition	3	3	6	8	4	12	15	12	27
Predicate nominal	-	-	-	1	-	1	1	-	1
Other	1	1	2	-	-	-	9	3	12
Total			87			136			205
Ratio of non-subjects to all relative pronouns			41%			48%			43%

In an earlier section on interrogative pronouns we considered the hypothesis that pronouns in subject position would be easier for fourth graders to produce than pronouns in non-subject positions which require a change in the usual sentence word order. There no significant difference was found between the grades.

The same possibility can be considered for relative pronouns. Again no significant difference between the grades is found. Of the relative pronouns produced by fourth graders, 41% were non-subjects; for eighth graders 48% were non-subjects; for twelfth graders 43% were non-subjects. (Table 16)

Adverb Clauses For Three Grades

The position of noun and adjective clauses is fixed inside the main clause which contains them. The position of a noun clause is inseparable from its function as subject or object, etc. The position of an adjective clause is also fixed; it always follows the noun it modifies.

The adverbial clauses to be discussed here are not fixed, but movable. That is, they can appear in initial position (before their main clause), they can appear in final position (after their main clause), or they can interrupt their main clause.

The transformation that converts a sentence into an adverbial clause and attaches it to another sentence is simple. "He came" is easily combined with "I left" to produce "If he came I left" or "When he came I left" or "Because he came I left," or "Even though he came I left." A subordinator is placed before the second sentence and the resulting structure is placed before or after the second sentence. No problem of choosing an appropriate relative pronoun or interrogative pronoun is involved, and no change of word order is involved.

Fourth graders produce these movable adverbial clauses with facility, though not so frequently as do older students. The number of occurrences for the three grades is 222, 252, 269. In percents the increase is 82% to 93% to 100%. (Table 17)

The Words Introducing Adverbial Clauses

Several investigators have reported the frequency of adverbial clauses according to a semantic sub-classification. LaBrant and Harrell and Watts are among them. Usually time and cause clauses are reported to be most common.

This study has not used that classification because many clauses can be fitted to it only arbitrarily. However, the words introducing all adverbial clauses have been tabulated. They appear in Table 17.

As shown there, all three grades rely especially heavily on three subordinators, _when_, _if_, and _because_. Those three account for a large percentage of all movable clauses for all grades: 74%, 64%, 61%. However, among the three the favorite changes. _When_ is the favorite of fourth graders, but its frequency drops from 101 occurrences to 73 to 53. _Because_ stays about the same. _If_ increases sharply in twelfth grade usage, changing from 30 to 33 to 73 occurrences. One is tempted to speculate that the shift in subordinators reflects a shift in type of thinking, away from time orientation to an if-then type of thinking.

The repertoire of different subordinators increases with the older grades, from 19 to 27 to 31.

Table 17 Frequency of Subordinators Used by Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
when	51	50	101	31	42	73	26	27	53
whenever				1		1			
even when								1	1
when and if				1		1			
if or when								1	1
if	16	14	30	17	16	33	33	40	73
even if							1	1	2
as if				1		1			
(see when and if, if or when)									
because	18	16	34	16	19	35	13	25	38
because how...?								1	1
as		2	2	5	5	10	16	5	21
just as	1	1	2		2	2	1		1
while	5	8	13	3	6	9	4	1	5
until		4	4	5	12	17	6	2	8
not until								1	1
till	1	1	2		4	4	1		1
after	4	3	7	6	5	11	3	6	9
right after		1	1						
before	1	1	2	6	5	11	2	8	10
just before								1	1
right before					1	1			
so	3	2	5	3	10	13	1	1	2
so that	2		2	1	1	2	6	3	9
since		2	2	5	2	7	2	6	8
ever since	1		1						
like	3	5	8	3	4	7		1	1
where	1	2	3	2	1	3	1		1
although				2	1	3	3		3
even though	1	1	2				1	1	2
unless				1	1	2	2	2	4
once								2	2
except that					1	1			
except Ø					1	1			
whether							1		1
whereas								1	1
different than				1		1			
special "which"					1	1		3	3
no matter what		1	1				1		1
no matter how					1	1	1	2	3
no matter if					1	1	2		2
Total	108	114	222	110	142	252	127	142	269
Number of subordinators			19			27			31

The Position Of Adverb Clauses

Rhetoric handbooks occasionally urge students to achieve variety in word order by putting adverbial clauses at the beginning of sentences instead of at the end. Such advice is usually exemplified by sentences for which the advice is clearly sound. But if the student generalizes from those specially chosen examples, then, according to the evidence of this study, he will have been misled.

If in Table 18 we look to the total for all movable adverbial clauses, we see that the initial position is preferred by fourth graders more strongly than it is preferred either by the eighth or the twelfth graders. Preferring that position can hardly be called a mark of maturity.

If we look to the individual subordinators and the position their clauses usually occupy, we note something that has not often been remarked. Though all these have been described as movable,[1] certain subordinate clauses seem more comfortable in final position, whereas others seem more comfortable in initial position. For instance, in the writings of all three grades, because-clauses are far more common in final position than in initial or medial position. Before-clauses are usually final, and after-clauses are usually initial. The number of instances is too small, of course, to allow any generalizations.

---

[1] It is doubtful that like-clauses are movable for many people; perhaps like is a coordinator or perhaps it is neither a subordinator nor a coordinator. As, which is often spoken of as the "correct" form to replace like, introduces movable clauses and so is clearly a subordinator. (The use of like-clauses declines sharply among the writers in this study.)

Table 18--Positions of Movable Adverbial Clauses As Introduced by Specified Subordinators for Each Grade

I = Initial: preceding the main clause
M = Medial: interrupting the main clause
F = Final: following the main clause

		Grade 4			Grade 8			Grade 12		
		Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
when	I	45	37	82	23	24	47	14	13	27
	M		1	1	2	1	3	4	2	6
	F	6	12	18	6	17	23	8	10	18
whenever	F				1		1			
even when	I								1	1
when and if	I				1		1			
if or when	I								1	1
(second day when)	I								1	1
	F								1	1
if	I	12	10	22	11	7	18	20	23	43
	M	2	1	3	1	2	3	4	3	7
	F	2	3	5	5	7	12	9	14	23
even if	I								1	1
	F							1		1
as if	F				1		1			
(see when and if, if or when)										
because	I		1	1	1		1		1	1
	M				4		4		2	2
	F	18	15	33	11	19	30	13	22	35
because...how	F								1	1
as	I				3	3	6	13	5	18
	M					1	1			
	F		2	2	2	1	3	3		3
just as	I	1		1		1	1	1		1
	F		1	1		1	1			
while	I	4	2	6	1	3	4	2		2
	M							1		1
	F	1	6	7	2	3	5	1	1	2

Table 18--Continued

		Grade 4			Grade 8			Grade 12		
		Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
until	I					1	1		1	1
	F		4	4	5	11	16	6	1	7
not until	F								1	1
till	F	1	1	2		4	4	1		1
after	I	2	3	5	6	3	9	2	6	8
	F	2		2		2	2	1		1
right after	I		1	1						
before	I				1		1		1	1
	F	1	1	2	5	5	10	2	7	9
just before	I								1	1
right before	I					1	1			
so	M				1		1			
	F	3	2	5	2	10	12	1	1	2
so that	F	2		2	1	1	2	6	3	9
since	I				1	1	2	1	2	3
	M							1		1
	F		2	2	4	1	5		4	4
ever since	I	1		1						
like	M				1		1			
	F	3	5	8	3	4	7		1	1
where	I		1	1						
	F	1	1	2	2	1	3	1		1
although	I					1	1	2		2
	M							1		1
	F				2		2			
even though	I	1	1	2						
	M							1		1
	F								1	1
unless	F				1	1	2	2	2	4

Table 18--Continued

		Grade 4			Grade 8			Grade 12		
		Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
once	I								1	1
	F								1	1
except that	F					1	1			
except ∅	F					1	1			
whether	F							1		1
whereas	I								1	1
different than	F				1		1			
special "which" This listing is questionable. An example: "He yelled, which made me mad."	F					1	1		3	3
no matter what	F		1	1				1		1
no matter how	I								2	2
	F					1	1	1		1
no matter if	F					1	1	2		2
Totals:										
In initial position				122 - 56%			93 - 37%			116 - 43%
In medial position				4 - 2%			13 - 5%			19 - 7%
In final position				96 - 42%			146 - 58%			134 - 50%
				222 - 100%			252 - 100%			269 - 100%

Interrupters are seldom used by anyone, but older students use them somewhat more frequently. In percentage of all clauses, their frequency for the three grades is 2%, 5%, 7%.

Clauses Of Comparison

Clauses of comparison like *I felt more discouraged than he did* clearly must be separated from other adverbial clauses like *I felt discouraged because he felt discouraged*. One dependent clause is movable but the other is not. We might say *Because he felt discouraged, I felt discouraged*, but not *Than he did, I felt more discouraged*.

The comparative clause often functions like an adverb of degree such as *very*, *rather*, *quite*. *I felt very discouraged* is related to the hypothetical *I felt (more-than-he-felt-discouraged) discouraged*, with certain elements transposed and deleted.

The clause of comparison can modify adverb as well as adjectives, just as *very* can: *I played very poorly*, *I played more poorly than he did*. Furthermore, under certain circumstances *more...than* can be replaced by *-er than*, *less...than*, *as...as*, *so...that* (I felt so discouraged (that) I cried).

There is no significant increase in the number of comparison clauses from fourth grade to twelfth. However, the two older grades do vary the pattern more widely, each using eight forms of the comparative, whereas fourth graders use only four. These patterns are given in Table 19.

Reduced Clauses Of Comparison

Clauses of comparison are often reduced by the deletion of some or all of the elements common both to the main clause and the clause of com-

Table 19--Structures of Comparative Clauses Used by Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
so Adj. that Sentence	2	1	3	6	2	8	1	-	1
as Adv. as S	-	2	2	-	1	1	-	-	-
so Adj. 0 S	-	2	2	1	-	1	-	1	1
so Adv. 0 S	-	1	1	-	-	-	-	-	-
as Adj. as S	-	-	-	1	2	3	2	-	2
same thing then as S	-	-	-	1	-	1	-	-	-
as much as S	-	-	-	-	1	1	1	-	1
more than S	-	-	-	-	1	1	1	1	2
less than S	-	-	-	-	1	1	-	-	-
to such an extent that S	-	-	-	-	-	-	1	-	1
-er than S	-	-	-	-	-	-	-	1	1
so much that S	-	-	-	-	-	-	-	1	1
Total	2	6	8	9	8	17	6	4	10
No. of different structures used			4			8			8

parison. Thus "I played more poorly than Jim played" becomes "I played more poorly than Jim." Such reduced clauses of comparison were not common, but they were used more often by the two older grades (9, 16, 15).

A Clause As Complement To An Adjective

Clauses can appear as complements to certain adjectives as in "I'm glad (that) you can come." This construction was used 7 times by fourth graders, 7 times by eighth graders, and 13 times by twelfth graders. There is no indication that twelfth graders use it more often characteristically, however, for the girls in that grade used it 11 times while the boys used it only twice.

In all examples, the adjective was in predicate adjective position. The clause cannot be moved away from the adjective.

The Subjunctive Inversion Of Word Order

Two twelfth grade girls produced subjunctive forms beginning "Had I not..." and "Had it been..." This inversion was not used by younger students.

Subjunctive clauses like these are subordinate; they cannot constitute a sentence by themselves. They are movable with respect to their main clause, but were not totaled in with adverbial clauses. They have no subordinating word like an *if*.

"The More The Merrier"

Sentences like "the more the merrier" are descendants from old Anglo-Saxon instrumental correlatives. That rare pattern is still alive today, and variations on it were produced five times by twelfth graders, only once by eighth graders, and not at all by fourth graders.

The examples were:

Eighth grade

> "The faster the population increases the faster more housing, towns, roads, and schools have to be built."

Twelfth grade

> "The deeper everyone got trying to find out who killed Macbeth, then the more trouble was brought upon them."
>
> "The more time spent on sentence structure by writing paragraphs and themes, the better acquainted a student becomes to the rules."
>
> "The hotter it gets, the more they wear."
>
> "They think that the more clothing they wear, the better it will block out the heat."
>
> "The more you think about it the sillier it gets."

The "Deferred Subject" Sentence

Sentences like "It was good that he came," "It was good for him to come" can be derived from "That he came was good," "For him to come was good."

The frequency of such sentences was 15, 22, 37.

The "Cleft" Sentence

The "cleft" sentence differs from the "deferred subject" sentence, in that it cannot be derived in the same way. "It is the woman who always pays" cannot be derived from "who always pays is the woman." Similarly, "It was in 1953 that it happened" cannot be derived from "That it happened was in 1953."

The frequency of such "cleft" sentences was 25, 16, 18.

Summary On Subordinate Clauses

The frequency of the various types of clauses is summarized in Table 20.

1. Twelfth graders produce more subordinate clauses of every type than do fourth graders.

2. Noun clauses exclusive of direct discourse nearly double in frequency, but the major increase comes late in the time span: 52%, 58%, 100%. Including direct discourse the percentage shifts to 79%, 67%, 100%.

3. The use of noun clauses as non-objects may indicate maturity.

4. Adjective clauses more than double in frequency: 46%, 68%, 100%. The increase is about even in both halves of the time span.

5. Adverb clauses increase less than noun and adjective clauses: 82%, 93%, 100%.

Table 20--Summary of Subordinate Clause Frequency for Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Noun clauses									
that or Ø, etc.	43	68	111	52	72	124	129	136	265
indirect question	24	51	75	48	32	80	49	39	88
Sub-total			186			204			353
			52%			58%			100%
direct discourse	30	76	106	8	35	43	6	12	18
Total	97	195	292	108	139	247	184	187	371
			79%			67%			100%
Adjective clauses	42	54	96	74	70	144	113	97	210
			46%			68%			100%
Adverb clauses	108	114	222	110	142	252	127	142	269
			82%			93%			100%
Clauses of comparison	2	6	8	9	8	17	6	4	10
Adjective complement clauses	4	3	7	2	5	7	2	11	13
Word order subjunctive	-	-	-	-	-	-	-	2	2
Total of all subordinate clauses	253	372	625	303	364	667	432	443	875
			71%			76%			100%
Total not including direct discourse	223	296	519	295	329	624	426	431	857
			61%			73%			100%

6. The placing of adverb clauses in initial position is apparently no indication of maturity.

7. The small classes of so-called adverb clauses appear so infrequently that no generalizations can be made.

8. Fourth graders produce the three major kinds of subordinate clauses with apparent ease and fluency. They show no hesitation in using relative pronoun or interrogative pronoun clauses, and they show no hesitation in using such pronouns as non-subjects.

9. The variety of words introducing the various kinds of clauses increases a little with age.

10. The increase in number of subordinate clauses helps to explain why T-units are longer for successively older grades. However, it obviously does not help to explain why the length of clauses increases from grades four to eight or why the length of single-clause T-units also increases even between grades eight and twelve. To explain those increases we will need to examine non-clauses.

5. FINDINGS: COORDINATION WITHIN T-UNITS

The discussion of subordinate clauses was concerned almost exclusively with the external relations of those clauses, that is, with their relations to all or part of the main clause. The following discussion will be concerned with the internal relations of all clauses, and with subordinate clauses as parts of T-units.

It is quite possible that the external relations of subordinate clauses have received inordinate emphasis in language development studies and that they are no more significant of growth than are the non-clause structures which have received less attention. LaBrant was sharply aware of the importance of non-clause structures, for while she felt that she found no significant growth in the length of clauses for her school children, she did find that her eminent psychologists wrote clauses nearly twice as long. How did they do that? What went into those clauses? She wrote

> Of interest is the average length of clauses. While the average clause written by children in Group A contains 7.2 words, and that by high-school pupils (Group B) only 8.0, the formal writing of the psychologists here studied averages 15.2, or nearly twice as many words to a clause. This increase in length is apparently occasioned by the reduction of clauses to participial and infinitive phrases, and by the elision of words, phrases, and clauses. Analysis of such writing offers an interesting problem for further study, but does not fall within the province of the present investigation (p. 474).

It is to that "interesting problem" that we now address ourselves. We do not have the long clauses of eminent psychologists to explain, but we have found that older students write longer T-units, and that T-units containing only one clause are lengthened from grade to grade at almost precisely the same rate as are T-units that contain multiple clauses. Obviously non-clauses play an important part.

The Plan For The Following Sections

We will first get out of the way coordination within T-units, for coordination operates on all the structures to be discussed afterwards: on subjects and objects, on verbs, on verb modifiers, and even on clauses within T-units.

Next we will turn to nominals, for they provide the subject for every T-unit, and often much of the predicate too. Next, verbs, first the auxiliary structure, and then the full verb with its objects and complements, etc. Next the verb modifiers, and lastly the predicate adjectives, since they are not here treated as modifiers of the subject nominal. Non-clauses will receive special attention.

At all times we will be concerned to see how sentence structures are transformed -- or as LaBrant says it, "reduced and elided" -- into smaller structures. Our motivating hypothesis will be to see whether older students condense and consolidate, through sentence-combining transformations, a larger number of kernel sentences to produce their longer T-units and their maturer thousand words.

Coordination Within T-units

Already an important distinction has been made between the coordination of T-units and the coordination of elements within a T-unit. The one is subject to over-use at the hands of a few fourth graders, but, as will be shown below, the other is not.

The problems of coordination, including both the productions of lists and of "parallel structures," require considerable grammatical perception. Only structures of the same sort (dominated by identical phrase-markers) can be coordinated. For instance, a subordinate clause cannot be coordinated with a main clause.

In these matters, fourth graders are firmly within the norm established by the older students. The number of coordinations within T-units ranges, for the individuals in the fourth grade, from 11 to 27; for individual eighth graders the range is from 11 to (except for one 45 and one 34) 26; twelfth graders range from 11 to 26. (See Table 21). Such uniformity is remarkable.

Table 22, which lists all the different patterns which make up structures of coordination (except those inside a nominal) shows that eighth graders used the various patterns on more occasions, and also used a wider variety of patterns than did fourth graders or twelfth graders. The differences may or may not be linguistically significant.

The one most important conclusion to be drawn from all this is that fourth graders use coordination inside T-units with no suggestion of excess, though some of them use and between T-units, we saw earlier, with an excess approaching abandon.

Table 21--Number of Coordinations Inside T-units For Each Student

Note: Coordinations inside nominals are tabulated later, not here.

Grade 4		Grade 8		Grade 12	
Student number	Number of times coordination was used	Student number	Number of times coordination was used	Student number	Number of times coordination was used
Boys		**Boys**		**Boys**	
4-1	15	8-1	23	12-1	15
4-2	16	8-2	26	12-2	15
4-3	22	8-3	26	12-3	17
4-4	27	8-4	34	12-4	19
4-5	10	8-5	16	12-5	18
4-6	14	8-6	22	12-6	11
4-7	26	8-7	45	12-7	19
4-8	25	8-8	18	12-8	12
4-9	11	8-9	24	12-9	17
Group total	166	Group total	234	Group total	143
Girls		**Girls**		**Girls**	
4-10	25	8-10	21	12-10	23
4-11	18	8-11	20	12-11	19
4-12	24	8-12	18	12-12	22
4-13	24	8-13	19	12-13	21
4-14	20	8-14	16	12-14	26
4-15	24	8-15	20	12-15	24
4-16	18	8-16	18	12-16	15
4-17	18	8-17	22	12-17	16
4-18	27	8-18	11	12-18	18
Group total	198	Group total	165	Group total	184
Grade total	364	Grade total	399	Grade total	327

Table 22--Patterns Used as Structures of Coordination by All Grades

Note: Coordinations inside nominals are tabulated later, not here.

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
X and X	125	159	284	149	115	264	102	128	230
X or X	4	6	10	22	12	34	19	23	42
XX and X	4	10	14	13	4	17	5	10	15
X and X and X	15	5	20	7	5	12	3	1	4
X but X	5	5	10	1	6	7	4	6	10
XX	3	2	5	5	5	10	3	1	4
XXX		2	2	6	5	11		2	2
XXX and X	2	4	6	5	1	6		1	1
either X or X				4		4		1	1
X then X		1	1	1	1	2		1	1
X and X and X and X	1		1	1	1	2	1		1
X and X, X and X	1		1	3		3			
XX or X				2		2		1	1
X and XX	1		1	1	1	2			
X and X or X					1	2		1	1
X instead of X					3	3			
XXXX and X				2	1	3			
X as well as X							1	2	3
XXXX	1	1	2						
XXXXXXX	1		1	1		1			
XXXXXXXXXX					2	2			
Both X and X				1		1		1	1
rather X than X								2	2
X and X but X							2		2
not X but X							1	1	2
X and X and X or X				2		2			
X so X		1	1						
X and XX, X and X		1	1						
X and X, X and X, X and X	1		1						
X and X and X and X and X	1		1						
X and X and XXXXX					1	1			
X, XX and XX				1		1			
XXXXX and X		1	1						
X or X, X and X				1		1			
X or X or X	1		1						
X then X and X				1		1			
not only X but X					1	1			
XXXXXX				1		1			
XX and XXX and X				1		1			
X and X, X or X				1		1			
X or XXXX				1		1			
X and X and then X then X				1		1			
XXXX and X and X								1	1
X then X then X								1	1
X and X both							1		1
XX etc.							1		1
Number of different patterns			20			31			22

6. FINDINGS: NOMINALS WITHIN T-UNITS

In this study the term nominal is used for all words that function as subjects, direct objects, indirect objects, objects of prepositions, etc. If a noun subject, for instance, has an article and several modifiers attached to it, all those words would be considered part of the nominal. The various parts of nominals are discussed in this section.

There are, of course, nominals within nominals. A noun clause is itself a nominal, but will have as subject a smaller nominal, perhaps a noun or pronoun. If that subject is a noun modified by a prepositional phrase, then the object of the preposition is a nominal inside the phrasal modifier. Thus we have a nominal inside a modifier of a nominal inside the nominal clause. We have here three layers, nesting inside each other like chinese boxes.

The total number of nominals used by the three grades, figuring nominals as described above, appears in Table 23. The number of times one of them served as a subject, or direct object, is also given. Objects of prepositions, etc., appear only in the over all totals.

The fact that fourth graders used a few more subjects is mainly a corollary of the fact that they wrote more clauses (and hence shorter clauses) in the same 18,000 words that older students also produced. If two subjects were coordinated within a clause both were counted as subjects.

The number of words inside nominals bulks large in any discourse. If one is willing to count every word inside an adjective clause or a noun clause as part of a nominal, for instance, then it can be said that more than half the words in a piece of writing will probably be inside some nominal.

Table 23 The Number Of Nominals In Certain Positions Within A Clause, For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Subject	1417	1404	2821	1162	1200	2362	1055	1211	2266
Direct Object	835	839	1674	680	706	1386	731	817	1548
All nominals			5906			5369			5285

How The Nominals Were Analyzed

Nominals are of many different sorts. Some are single words. Others are common nouns serving as heads of structures with one or more modifiers attached to them. With modifiers they can achieve considerable length. These modifiers are themselves of many different sorts, the commonest sort being the adjective. Then too there are nominals several words long containing no head. The commonest of these non-headed structures is the noun clause. In addition to the noun clause there are different sorts of non-headed "near-clauses" to be mentioned later.

Whether the repertoire of nominal structures written by younger students is as large as that written by older students has never been ascertained. To investigate this and other matters, an abstract description was made for each nominal used by each of the 54 students in his thousand words of writing. There were more than 16,000 nominals. This abstract description required the classifying of words and phrases as nouns, proper nouns, personal pronouns, demonstrative pronouns, genitive pronouns, etc.; and as adjectives, adverbs modifying adjectives modifying nouns, prepositional phrases of place, etc. It involved classifying non-headed structures as clauses, as infinitival nominals, gerundive nominals, etc. All the categories discussed in this section on nominals were used.

As this analysis proceeded the investigators came to feel that a significant factor might be missed if the individual items were merely totaled. To take a simple example, suppose two students both use one adverb, two adjectives, a prepositional phrase, and an adjective clause as modifiers of common nouns. Suppose, too, that one of those students spreads these modifiers out to modify four different nouns, whereas the other uses all of them at once to modify a single noun. Does one student demonstrate the same maturity of command as the other? One might speculate about the answer, but as yet there is no experimental data to support speculation. To supply such data, then, the investigators decided to preserve the structure of each nominal as a sequence of "elements" in combination. The long nominal referred to above as being written by the second student was listed as adjective + adverb + adjective + common noun + prepositional phrase + adjective clause. (...the tall, rather ugly sailor with a limp who had offered them the prize...) Furthermore, how many nominals of precisely this description were written by that student and other students? How many times did they appear among the writings of the six different groups? Obviously chance would play a large part in the frequency of the re-occurrence of any one such combination, but perhaps some conclusions could be drawn, at least tentatively.

To facilitate the tabulation of these separate "elements" and these combinations, the abstract description of every nominal (except the commonest) was put on a card. The cards were then sorted out by a computer. On the basis of that analysis the following observations are made.

The Commonest Nominals

The expressions most frequently used as nominals by each grade are found to be either single-word nominals or nominals consisting of a single word plus an article, or a single name like John or John Smith. That is, they are (1) proper nouns, (2) common nouns, and (3) personal pronouns, all by themselves without modifiers. Together these three sorts constitute roughly half the total nominals written at any grade.

There are differences in the reliance placed on these three nominals by the different grades. For instance, the youngest students lean on them most heavily. Of all nominals written by fourth graders these three kinds make up 65% of the total. Eighth graders used them only 57% of the time, and twelfth graders only 48% of the time.

The forms mentioned here are extremely simple -- as simple as any the language provides. Genitive modifiers have been excluded for the moment, and all nouns that appeared with modifiers have been excluded too. Since these nominals are simple, and the most frequently used of all nominal structures, and since they are used less frequently by successively older grades, we can make our first assertion about maturity as shown in nominal structures: the commonest nominals are relied on less heavily by successively older grades.

Among these simplest nominals there are differences which reflect the choice of subject matter by the youngest students. The fact that fourth graders usually wrote narratives about people or animals with names they knew accounts for the fact that they used decidedly more proper nouns (712 as compared with 542 and 336). That same choice of subject matter

Table 24--Frequency of Unmodified Nouns and Pronouns for Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Common nouns	737	634	1371	654	593	1247	492	654	1146
Proper nouns	315	397	712	191	351	542	208	128	336
Personal pronouns excluding *it*	882	736	1618	520	571	1091	410	519	929
It as personal pronoun	94	70	164	101	64	165	39	57	96
Total			3865			3045			2507
% of total nominals			65%			57%			48%
Total nominals			5906			5369			5285

The number of unmodified nouns and pronouns used by each student was subjected to analysis of variance, 2 x 3 factorial. The significance was found to be at the .01 level for grade and .05 level for the interaction of sex and grade.

possibly explains why they used more personal pronouns. Excluding the non-animate *it*, they used 1618 personal pronouns as compared with 1091 and 929. Including pronoun *it* the count is 1782, 1256, 1025.

How Transformations Produce Modifiers

According to transformational theory -- somewhat simplified -- certain sentences can be combined to produce other sentences. For instance, a sentence such as "A whale came up" can be combined with a sentence such as "The whale was big" to produce the new sentence "A big whale came up." In this fashion the second sentence, containing a predicate adjective, contributes a modifier to the new and larger sentence. The new sentence, it should be noticed, is a shortened or consolidated version of the original two.

Other noun modifiers can be produced in a similar fashion. For instance, a sentence such as "He talked to the people" can be combined with a sentence such as "The people were on the ship" to produce the new sentence "He talked to the people on the ship." From the second sentence only the prepositional phrase of place survives as a modifier of a noun in the new consolidated sentence.

Similarly, genitive modifiers can be added to nouns. Genitive modifiers are of several sorts and are derived in several ways, but what is called the possessive genitive appears to be derivable from a sentence with *have*. Thus a sentence such as "He plays with the cat" can be combined with a sentence such as "The next door neighbors have a cat" to produce the new sentence "He plays with the next door neighbors' cat." The possessive is also expressed with *of* plus a nominal. This phrasal form is sometimes but not always interchangeable with the inflected form.

Noun adjuncts are derived from sentences, too, though in a wide variety of ways. "The neighbors have a cat," for instance, can be combined with "The neighbors live next door" to produce "The next door neighbors have a cat."

Past participles modifying nouns can usually be derived from passive sentences. "A girl was fixing her hair" plus "The girl was named Marigold" can produce "A girl named Marigold was fixing her hair."

Present participles of verbs can modify nouns that in other sentences serve as subjects of those verbs. Thus "The member of the crew told the story." plus "The member of the crew survived" produce "The surviving member of the crew told the story."

Infinitives can modify nouns which in other sentences would be their subjects or objects. Thus "He needs a tutor" can be combined with "The tutor is to help him with his math" to produce "He needs a tutor to help him with his math."

An adjective clause can be embedded in a main clause by another transformation. Thus "He plays with the cat" plus "The cat lives next door" can be combined to produce "He plays with the cat that lives next door."

Indeed, several of the single-word modifiers of nouns just discussed can be regarded as transformed from adjective clauses by the deletion of the relative pronoun and a form of BE. For instance, "A big whale came up" can be derived from "A whale which was big came up." "He talked to the people on the ship" can be derived from "He talked to the people who were on the ship." "A girl named Marigold was fixing her hair" can be derived from "A girl who was named Marigold was fixing her hair." Not all adjective clauses can be reduced to single words and phrases, in this fashion, but enough can to cast doubt on the wisdom of looking for language maturity only in subordinate clause structures. Perhaps just as much maturity is required to reduce clauses still further. At least the matter would be worth investigating.

Transformational theory is not to be understood to assert that people think in terms of the simplest sentences and then combine them as outlined above. No one knows whether or not people do. Transformational theory asserts, however, that the largest and most complex sentences are related to the simplest in something like the fashion suggested above, and that all the large sentences in the language can never be described explicitly except in terms of their relations to simpler ones.

Transformations like those exemplified here can be applied one after another after another to produce the most complicated nominals. An illustration will be given later.

A Hypothesis About Modifiers Of Nouns

One might hypothesize that in equal quantities of writing older students produce a larger total number of noun modifiers of all sorts than do younger students. This hypothesis is inviting since, if older students did so, it would probably make their nominal structures longer. If their nominal structures were longer, that would help to explain two phenomena already observed: first, that clauses, and more especially single-clause T-units, get longer with successively older grades; and, secondly, that the youngest students get a larger number of nominals written in the same number of words. Where there are more nominals per thousand words one might expect that the nominals would be shorter.

Data pertaining to these two hypotheses became available as a result of the listing of all nominal "elements" including modifiers, and the listing of all combinations intact.

Who Uses The Most Adjectives?

The noun modifiers most commonly used by all grades were adjectives. Not counting any articles or genitives as adjectives, the number used by each grade was 554, 895 and 917. The two older grades used distinctly more than the fourth grade. In percentage the increase was from 60% to 98% to 100%.

Who Uses The Most Genitives As Modifiers?

After adjectives, the next commonest modifiers of nouns were other nouns in the genitive form. Genitive inflections may be added to nouns (the neighbor's cat) and to pronouns (my dog). In addition, the phrasal genitive with of is commonly used with nouns (the floor of the room) and less commonly with pronouns (that car of yours). The total of both inflected and phrasal genitives for both nouns and pronouns increases slightly with successively older grades, though the main increase is late, between eighth and twelfth grades. The totals of inflected and phrasal genitives for each grade are 632, 652, 809; in percents 78%, 81%, 100%. (Table 25)

If we start keeping a running total of modifiers, we find that each successively older grade is substantially ahead of the younger grade. The totals for all adjective and genitive modifiers are 1186, 1547, 1726.

The fact that the phrasal genitive with of increases while the inflected genitive of pronouns decreases may be due to the effect of two phenomena: (1) that fourth graders use an especially large number of personal pronouns whereas older students use nouns instead; and (2) that pronouns are more likely to take the inflected genitive whereas nouns are more likely to take the phrasal genitive, as was shown by C. C. Fries, in American English Grammar, (p. 72 ff.)

Table 25 Number Of Inflected Genitives And Phrasal Genitives With Of For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girl	All
Personal pronouns in genitive	192	220	412	110	135	245	142	182	324
Noun in genitive	40	51	91	27	28	55	46	29	75
Of followed by a nominal	57	72	129	195	157	352	226	184	410
Totals			632			652			809
			78%			81%			100%

Who Uses The Most Prepositional Phrases As Modifiers Of Nouns?

The third most frequent modifiers of nouns are prepositional phrases. A wide variety of prepositions is used, with a wide variety of transformational derivations. (The genitive with of is not included here, of course.) Many prepositional phrases can be derived from sentences with a form of BE standing between the noun and the phrase. Expressions of place, for instance, can be so derived. "A lamp by the bed" can be derived from "A lamp is by the bed." However, the by which does not signify place, as in "a book by

Dickens," which might be derived from "The book is by Dickens," is more probably derived from a different source. The source appears to be "The book is written by Dickens," derived in turn from the active "Dickens wrote the book." In the active sentence the by does not appear. Whatever the derivation of the various phrases may be, it appears likely that all can be derived through sentence-combining transformations.

Prepositional phrases are used more frequently by successively older grades, the number of occurrences being 133, 229, and 318. In percents the increase is 42%, 72%, and 100%. The frequency doubles over our time span, and the increase is roughly equal in the early and late periods. (Table 26)

Our running total for modifiers of nouns now stands at 1319, 1776, 2044.

Who Uses The Most Adjective Clauses And Noun Adjuncts?

After prepositional phrases, the next most frequent modifiers of nouns at the various grades are either noun adjuncts or adjective clauses. Since adjective clauses have already been discussed in an earlier section, only their frequency here need be mentioned. In our eight year span they more than double. The increase is about the same from grade to grade. Their frequency is 96, 144, 210. The percents are 46%, 68%, 100%.

The running totals for modifiers so far are 1415, 1920, 2254.

Whether a student will use an uninflected noun to modify another noun, thus producing a noun adjunct like next door neighbor, is not a matter of personal choice in the same way that the use of most modifiers is. The language prescribes for him rather narrowly which nouns have already formed

Table 26--Prepositional Phrases Used To Modify Nouns

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Phrases indicating place	39	35	74	74	45	119	47	60	107
Phrases indicating purpose	1	2	3	2	3	5	-	2	2
Phrases indicating time	-	1	1	-	-	-	2	-	2
Phrases not indicating place, purpose or time									
for	4	3	7	15	15	30	20	10	30
on	2	2	4	1	2	3	26	16	42
with	5	8	13	6	7	13	7	10	17
to	6	1	7	-	4	4	14	12	26
about	4	8	12	6	7	13	8	7	15
in	1	-	1	1	2	3	11	12	23
as	-	-	-	1	7	8	5	5	10
like	2	-	2	2	3	5	5	1	6
except	1	5	6	3	3	6	4	2	6
from	1	-	1	-	2	2	3	2	5
against	1	-	1	-	1	1	1	2	3
between	-	-	-	-	-	-	-	1	1
after	-	-	-	-	-	-	3	1	4
out of	-	-	-	4	5	9	-	-	-
similar to	-	-	-	-	-	-	-	1	1
toward(s)	-	-	-	-	2	2	1	1	2
by	-	-	-	-	1	1	1	-	1
besides	-	-	-	-	-	-	1	-	1
before	-	-	-	-	2	2	-	-	-
along with	-	-	-	-	1	1	2	-	2
instead of	-	-	-	-	-	-	2	-	2
over	-	-	-	-	-	-	1	-	1
upon	-	-	-	-	-	-	4	-	4
at	-	-	-	-	-	-	1	-	1
Other phrases	1	-	1	1	1	2	3	1	4
Total	68	65	133	116	113	229	172	146	318

adjuncts and which have not. A child probably learns noun adjuncts the way he learns compound nouns -- as single names of things. It would not be surprising, then, if the frequency of this structure fluctuated from grade to grade, depending on factors which have nothing to do with maturity. The frequency does fluctuate; it is 157, 205, 127.

Our running total is now 1572, 2125, 2381.

Who Uses The Most Verb Forms As Modifiers Of Nouns?

Verbs, and often whole predicates, can become modifiers of the same nouns which can be their subjects or objects. The finite verb ending is replaced with a to or an -ing. Or the form of BE is removed before the past participle in a passive. Sometimes a single-word verbal precedes the noun, but multi-word transformed predicates usually follow the noun.

The frequency of these structures is shown in the following table.

Table 27 Transformed Predicates Used As Modifiers Of Nouns By Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Infinitives	6	8	14	9	21	30	34	25	59
Present participles	19	37	56	23	32	55	29	40	69
Past participles	8	22	30	31	46	77	41	23	64
Total			100			162			192
% of Grade 12 frequency			52%			84%			100%

Again the number of such transformations increases with successively older grades. The numbers are 100, 162, 192. The percentage increases from 52% to 84% to 100%.

The running total now stands at 1672, 2287, 2573.

Single-word Expressions Of Place As Modifiers Of Nouns

A sprinkling of single-word expressions of place appeared as modifiers of nouns (the family upstairs, the fountain there). For the three grades there were only 6, 4 and 4. They bring the final total of modifiers to 1678, 2291, and 2577.

Who Used The Most Tansformations To Modify Nouns?

Toward the beginning of the section on modifiers of nouns there was suggested the hypothesis that successively older grades use more modifiers. Since each of these modifiers is produced by a sentence-combining transformation, the hypothesis implies more transformations as well as more modifiers.

Now that we have reached the final total we can see that the hypothesis has been supported. The figures are 1678, 2291, 2577. In percentages the increase is from 65% to 89% to 100%. There is more gain during the first half of the time span.

Though the gain is not great, it has been steadily manifested. Almost every time a new modifier of a noun was tabulated, successively older grades were found to use it more often. That was true of adjectives, genitives, prepositional phrases, verbal forms, adjective clauses. It was not true for adjuncts, but they are a very special case. That it is not true of the trifling number of single-word expressions of place is insignificant.

The fact that older grades use more modifiers is not inconsistent with any of our previous findings. It is even, perhaps, to be expected from the fact that younger students use a larger proportion of non-modified nominals.

The summary in Table 28 reminds us of a point which has been raised on several occasions already: Is it appropriate in language development studies to observe the increase in clauses but not in non-clauses? We cannot answer that question fully yet, but we can observe that, among modifiers of nouns, non-clauses are several times as frequent as clauses. In fourth grade writing non-clause modifiers of nouns are more than fifteen times as common as clause modifiers. In eighth grade writing they are again fifteen times as common. In twelfth grade they are eleven times as common. Clauses are a small fraction of all modifiers, then, and give a small part of the whole picture. However, the rate of increase for clauses is higher than for non-clauses.

The Formal Difference Between Headed And Non-Headed Nominals

So far we have studied the transformations that produce nouns with modifiers. The word which is there modified is called the head of the structure, and the whole structure is said to be headed.

Some nominals have no head; they cannot be modified, and are said to be non-headed. Noun clauses are the commonest examples.

The transformations that produce headed nominals are different from those that produce non-headed nominals. To produce a headed structure, both

Table 28--Summary of Modifiers of Nouns Used By Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Adjectives	259	295	554 60%	486	409	895 98%	489	428	917 100%
Genitives	289	343	632 78%	332	320	652 81%	414	395	809 100%
Prepositional phrases	68	65	133 42%	116	113	229 72%	172	146	318 100%
Adjective clauses	42	54	96 46%	74	70	144 69%	113	97	210 100%
Noun adjunct	78	79	157	161	44	205	45	82	127
Non-finite verbs	33	67	100 52%	63	99	162 84%	104	88	192 100%
Single-word expressions of place	-	6	6	-	4	4	3	1	4
Totals	769	909	1678 65%	1232	1059	2291 89%	1340	1237	2577 100%
Total of non-clauses	727	855	1582 67%	1158	989	2147 90%	1227	1140	2367 100%
Adjective clauses	42	54	96 46%	74	70	144 69%	113	97	210 100%

of the contributing sentences must contain the same noun: "A whale came up" plus "The whale was big" can produce "A big whale came up." Whale appeared in both contributing sentences.

On the other hand, two sentences combined to produce a non-headed structure do not contain the same noun. "She told me something" and "He was there" contain no word in common. Therefore they cannot be combined in any way to produce a headed nominal. But they can be combined so that the second sentence becomes a noun clause embedded within the first in place of the noun something: "She told me he was there." In the final product the word something has disappeared; in fact its presence in the first place was only hypothetical.

Some Transformations That Produce "Near-clause" Nominals

A non-headed nominal is made from a sentence in any of several ways. If the transformation preserves the finite verb ending, along with the subject, the resulting structure is a clause. Noun clauses have already been discussed.

The line between clauses and non-clauses is, from certain points of view, thin. Yet in language development studies noun clauses have received much attention, and non-clauses, or "near-clauses," relatively little.

Sentences can be transformed into non-headed nominals by replacing the finite verb ending (the tense marker) with a to. In addition the subject is sometimes deleted, or sometimes it is preceded with a for. Thus the sentence "The President vetoed the bill passed by Congress" can become the near-clause "for the President to veto the bill passed by Congress," or simply "to veto the bill passed by Congress." Either of these near-clauses can now replace hypothetical nouns of certain sorts in other sentences so as to produce such a sentence as "For the President to veto the bill passed by Congress was politically inadvisable." Such near-clauses are here called infinitival nominals. Such structures were produced by fourth graders 87 times, by eighth graders 100 times and by twelfth graders 143 times. In percentages the increase is from 61% to 70% to 100%.

Another way to transform a sentence into a non-headed near-clause is to replace the finite verb ending with an -*ing*. In addition, the subject is sometimes deleted, or sometimes is given a genitive form, or sometimes is not changed. Thus the sentence used as an example in the paragraph above can be transformed into the near-clause "the President's vetoing the bill passed by Congress." This can be embedded as the subject of another sentence, "The President's vetoing the bill passed by Congress was politically inadvisable." There are several variations within this general pattern, but all are grouped together here and are called gerundive nominals. They were produced by the three grades, 14 times, 56 times, 141 times. In percentages the increase is 10%, 40%, 100% -- a remarkably dramatic change.

A third kind of near-clause nominal is like the noun clause indirect question already discussed, except that the auxiliary or the (the tense marker) is replaced by a *to*. An example of the clause would be "She asked me how she could get to the airport." An example of the near-clause would be "She asked me how to get to the airport." This might be called the interrogative infinitival. It was not common, but was produced 18 times by fourth graders, 6 times by eighth graders, and 5 times by twelfth graders.

These three near-clause nominals, taken together, increase substantially with successively older grades. They appear 119, 162, and 289 times. In percentages the increase is from 41% to 56% to 100%. The main part of the increase appears late.

As a matter of fact the near-clauses appear to be a better index of maturity than the noun clauses which have received so much more general attention in language development studies. Noun clauses appeared only 292, 247, 341 times, thus showing a less significant increase.

The total number of clause and near-clause nominals is 411, 409, 660.

The running total of transformations used to produce both headed nominals and non-headed nominals is now 2089, 2700, and 3237. (Table 29)

Appositives

Appositives are of two sorts, one commonly called punctuated, and the other non-punctuated. Examples are "my friend Helen" and "John Milton, author of Paradise Lost." Both kinds of appositives can be derived from predicate nominal sentences: "Helen is my friend," "John Milton is the author of Paradise Lost." Fourth graders used about as many non-punctuated appositives as did older students, but less than half as many punctuated appositives as did eighth and twelfth graders. (Table 30)

Coordination Within Nominals

The frequency with which whole nominals were coordinated has already been discussed. In general, eighth graders used that structure more often than fourth or twelfth graders.

Table 29--Summary Of Non-headed Nominals Used By Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
"Near-clauses"									
Infinitival nominal	45	42	87	48	52	100	68	75	143
Gerundive nominal	7	7	14	26	30	56	65	76	141
Interrogative infinitival	10	8	18	2	4	6	3	2	5
Sub-total	62	57	119	76	86	162	136	153	289
			41%			56%			100%
Noun clauses									
that or Ø, etc.	43	68	111	52	72	124	129	136	265
indirect question	24	51	75	48	32	80	49	39	88
Sub-total			186			204			353
direct discourse	30	76	106	8	35	43	6	12	18
Sub-total	97	195	292	108	139	247	184	187	371
Total non-headed nominals	159	252	411	184	225	409	320	340	660
Total modifiers	769	909	1678	1232	1059	2291	1340	1237	2577
	928	1161	2089	1416	1284	2700	1660	1377	3237

Table 30 Punctuated And Non-Punctuated Appositives For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Punctuated appositives	10	10	20	20	26	46	28	15	43
Non-punctuated appositives	5	10	15	8	4	12	10	9	19
Total	15	20	35	28	30	58	38	24	62

Inside a nominal structure (inside a subject, for instance) it is possible to coordinate a variety of words and structures, modifiers as well as nouns. Such coordination was used more often by successively older grades: 32 times, 74 times, 102 times. Each such coordination requires a sentence-combining transformation. (Table 31)

Our running total of transformations including appositives and internal coordinations finally stands at 2156, 2832, and 3401.

This is the last time that coordinations need be tabulated. This is the third tabulation. An interesting observation can be made about the three, though perhaps it has no general significance. In the number of coordinations between main clauses (or more accurately T-units) the fourth graders were ahead -- too far ahead. In the number of coordinations used inside T-units but outside nominals, eighth graders were ahead. In the number of coordinations inside T-units twelfth graders are ahead, perhaps because they have more "material" inside nominals to coordinate.

Table 31--Coordinators Used Inside Nominals By Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
And	10	17	27	15	49	64	40	34	74
Or	2	2	4	2	4	6	11	10	21
But	1	-	1	1	-	1	1	2	3
As well as	-	-	-	-	-	-	2	-	2
Especially	-	-	-	1	-	1	-	-	-
Other than	-	-	-	-	-	-	1	-	1
Even	-	-	-	-	-	-	1	-	1
At least	-	-	-	-	1	1	-	-	-
Both ... and	-	-	-	-	1	1	-	-	-
Total	13	19	32	19	55	74	56	46	102
Number of different coordinators			3			6			6

Who Uses The "Longest" Nominals?

A hypothesis mentioned earlier was that if "length" of a nominal is measured by the number of transformations used to produce it, regardless of the number of words it contains, then older students use more of the "longer" nominals.

To test that hypothesis all nominals were sorted by machine into different groups according to the number of sentence-combining transformations required to produce each one.

The results are tabulated in Table 32. There we see that the "longest" nominal required nine transformations and was written by a twelfth grader. Two were eight long and were both produced by twelfth graders. Two were seven long, and both were by twelfth graders. Nominals requiring six transformations appeared in the twelfth grade (12 of them) and eighth (only 3) but not in the fourth at all. Those requiring five transformations at last appeared in all three grades, but older grades produced successively more: 3, 11, 17. Similarly along the list, older grades produced successively more: 9, 31, 36; then 38, 125, 150: then 228, 400, 458. Finally at one-transformation nominals the pattern varies a little. Twelfth graders are still ahead, but fourth graders, who use more nominals in all, and use more of the commonest unmodified nominals, and who are far behind so far, begin to show their strength. At one-transformation nominals they can nose out the eighth graders. Fourth graders use the shortest the most.

The hypothesis is supported.

Toward the beginning of the discussion on nominals we asked whether it showed more maturity to attach several modifiers -- perhaps, two adjectives, a prepositional phrase, and an adjective clause -- to a single noun, or to spread them out over four nouns.

If all we had to back an answer were what we learned earlier about the total number of modifiers used by each grade we might feel bound to say that the same maturity is demonstrated whether the four modifiers modify one noun or four.

But with the present section before us, we can say that a four-transformation nominal seems to require more maturity than four one-transformation nominals.

The total number of transformations does not tell the full story.

Table 32 "Length" Of Nominals Produced By Each Grade

Number of sentence-combining transformations used	Grade 4				Grade 8				Grade 12			
	Boys	Girls	All	%of Grade 12	Boys	Girls	All	% of Grade	Boys	Girls	All	% of Grade 12
1	701	833	1534	90%	758	708	1466	86%	820	875	1695	100%
2	100	128	228	50%	216	184	400	87%	244	214	458	100%
3	13	25	38	25%	65	60	125	83%	81	69	150	100%
4	4	5	9	25%	13	18	31	86%	21	15	36	100%
5	2	1	3	18%	4	7	11	65%	12	5	17	100%
6	-	-	-	0%	1	2	3	25%	6	6	12	100%
7	-	-	-	0%	-	-	-	0%	2	-	2	100%
8	-	-	-	0%	-	-	-	0%		-	2	100%
9	-	-	-	0%	-	-	-	0%	-	1	1	100%

The number of transformations used by each student was subjected to analysis of variance, 2 x 3 factorial. The numbers were found to be significant for grade at the .01 level.

Similarly, the number of nominals for each student requiring more than one transformation was also significant for grade at the .01 level. Similarly again, the number of nominals for each student requiring more than two transformations was also significant for grade at the .01 level.

A Sample "Long" Nominal

One of the longer (and perhaps more sprawling) nominals is the underlined portion of the following twelfth grade sentence. "Similarly related to this argument is *the example of what harm could be done to fellow men by someone advertising false claims about harmful medicines or other goods with a harmful effect on the recipient of them*."

The reader who is sufficiently curious about how so long a nominal can be built up from kernel sentences might have the patience to trace through the following interpretation. Several *ad hoc* derivations are suggested to account for the choice of the particular prepositions used in the original sentence. The sentence-combining operations are numbered, the others are not.

"Someone *receives the goods*" becomes "Someone is *the recipient of the goods*."(1) That plus "The goods affect the recipient harmfully" becomes "The goods affect harmfully the recipient of the goods." This becomes "The goods *have a harmful effect on* the recipient of the goods." This becomes "The goods *with* a harmful effect on the recipient of them." This nominal, preceded by *other*, is later to be coordinated, using *or*, with another nominal now to be developed.

(2) "The claims concern *medicines*" plus "The *medicines* are *harmful*"

become "The claims concern harmful medicines." This becomes "The claims are about harmful medicines." (3) This plus "The claims are false" become "The false claims are about harmful medicines." (4) This plus "Someone advertises claims" become "Someone advertises false claims about harmful medicines."

The coordination between "harmful medicines" and the previously developed nominal can be made now, though it probably should have been made as soon as "harmful medicines" was produced. That coordination was made no earlier simply to reduce the amount of reiteration in this explanation. The full nominal will be shortened for a while with marks of ellipsis.

As coordinated (5), it is "Someone advertises false claims about harmful medicines or other goods..." This becomes a gerundive nominal as subject of the clause "Something harms fellow men", (6) producing "Someone advertising false claims...harms fellow men." This becomes "Someone advertising false claims...could do harm to fellow men." This active sentence is transformed into the passive: "Harm could be done to fellow men by someone advertising false claims..."

This whole sentence is now about to be converted into an adjective clause modifying harm in a new sentence which itself is far more complicated than a kernel sentence. However, we will not derive the new containing sentence since we are concerned primarily with our example of a long twelfth-grade nominal.

The sentence to contain what we have been developing is "Similarly related to this argument is the example of such harm." That plus the one beginning "Harm could be done..." become (7) "Similarly related to this argument is the example of the harm which could be done..." Part of this is converted next: "...the example of the harm which..." becomes "...the example of what harm..." At last the whole long nominal as written by an "average" twelfth-grade girl has been produced. It is 31 words long, about four times as long as the average whole T-unit produced by a fourth grader. "Similarly related to this argument is the example of what harm could be done to fellow men by someone advertising false claims about harmful medicines or other goods with a harmful effect on the recipient of them."

This sentence is only a two-clause T-unit. But that meager number of clauses gives no indication that no less then six sentences have been absorbed in its production. This one "long" nominal illustrates the "condensation", the "density" of structure never found in the writing of beginners.

Who Has The Largest Repertoire Of Different Nominal Combinations?

The previous table on long nominals would lead us to expect that the younger students, writing "shorter" nominals, will not be able to achieve so wide a variety--so large a repertoire of different patterns--as do older students.

To investigate the matter more fully an abstract representation of each nominal was put on a card for machine sorting. A sample representation might mean "adjective + adverb + adjective + common noun + with + common noun + adjective clause." The machine then told how many nominals exactly fitting that description were written, and who wrote them.

The tabulation of more than 15,000 nominals ran to many pages, but the results are summarized in Table 33. Unmodified nouns and pronouns were used about a thousand times, as we saw earlier, by each grade. Another seven

Table 33--The Number of Different Nominal Combinations Used a Specified Number of Times by Each Group and Each Grade Separately

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Combinations used more than 900 times			2			2			2
Combinations used more than 100 times	5	5	9	6	4	10	5	5	9
Combinations used more than 10 times	20	23	35	27	24	35	28	28	40
Combinations used more than 5 times	31	36	42	32	35	45	35	41	49
Combinations used more than 25 times	43	46	61	49	54	75	59	52	85
Combinations used more than once	54	62	83	78	73	109	80	79	122
Combinations used at least once: Total in repertoire	110	147	200	180	214	322	284	243	438
Total nominals used			5906			5369			5285

or eight combinations were used from 100 to 900 times by each grade. Another twenty-five to thirty combinations were used from 11 to 99 times by each grade. The number of combinations used more than 5 times by each grade is close to the same: 42, 45, 49. Each grade used about the same sized repertoire for ordinary occasions (the repertoire happens also to include almost the same combinations).

As we continue, looking at the rarer combinations, the three grades begin to separate themselves. The number of combinations used 3 times and more is 61, 75, 85. The number used 2 times and more is 83, 109, 122. Finally when we total the number used once or more, the difference jumps suddenly, for the final totals are 200, 322, 438. The frequency more than doubles. Most of the "long" nominals appear among the rare nominals. In percents the increase in repertoire from grade to grade is 45% to 73% to 100%--steady across the full time span.

On special occasions the older students have recourse to a wider variety of devices than appear to be accessible to the younger students. This may be a major characteristic of maturity.

Summary Of Findings On Nominals

1. Fourth graders produce about ten percent more nominals than do students in the older grades. This is related, at least in part, to the fact that their clauses are shorter, and in a given number of words they write more clauses with more subjects and objects, etc.

2. The simplest nominals--personal pronouns, unmodified common nouns, and proper names--constitute a decreasing proportion of all the nominals produced by successively older students: 65%, 57%, 48% (Table 24). Older students rely more heavily on more elaborate structures.

3. The successively older grades tend to use successively larger numbers of almost every kind of modifier of nouns. The total number of them used by each grade is 1678, 2291, 2577 (Table 28).

4. Non-headed "near-clause" nominals are used with increasing frequency by older students: 119, 162, 289 (41%, 56%, 100%; Table 29).

5. Non-headed "near-clause" and noun clause nominals, which nominalize sentences, are used more often by twelfth graders: 411, 409, 660 (Table 29).

6. Successively older grades produce "longer" nominals, counting as "length" the number of sentence-combining transformations used to produce each one. (Table 32)

7. The repertoire of different nominal combinations is larger for successively older grades (Table 33).

7. FINDINGS: VERB PHRASES WITHIN T-UNITS

The Verb Auxiliary

In general, the verb auxiliary becomes a little more complicated with successively older grades. At least there is an increase in the frequency of modal auxiliaries, "perfect tenses" with have, and in passives. (Table 34)

The progressive forms maintain a constant frequency in fourth and eighth grades, and then drop sharply in the twelfth grade.

Do as an auxiliary maintains a constant frequency. It is used primarily to form the negative (doesn't, don't). If questions had been common, as they are in speech, then do would have been used commonly in forming them.

Eight modals (will, would, shall, should, can, could, may, might) are used 194 times by fourth graders, 239 times by eighth graders and 407 times by twelfth graders. By percents the increase is from 48% to 58% to 100%. Thus the increase is substantial from fourth grade to eighth, but still more pronounced from eighth to twelfth. It indicates, perhaps, an increased shading or modulating of the meaning expressed by the main verb.

The frequency of the perfect forms (have followed by a past participle) increases substantially, especially from fourth to eighth grades. (The number of occurrences is 50, 125, 144; the percent of increase is from 35% to 87% to 100%).

The passive form (BE followed by a past participle) increases also between the grades: from 50 to 142 to 185. In percents the increase is from 27% to 79% to 100%.

Table 34--Certain Verb Auxiliary Forms For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
will Verb	11	22	33	11	31	42	21	32	53
would V	33	42	75	42	49	91	64	60	124
shall V	-	-	-	-	-	-	4	1	5
should V	3	1	4	5	2	7	18	28	46
may V	2	-	2	1	3	4	11	13	24
might V	3	1	4	2	2	4	2	-	2
can V	13	12	25	9	17	26	24	71	95
could V	26	25	51	44	21	65	30	28	58
do V	40	43	83	32	50	82	39	32	71
have to V	15	17	32	16	14	30	17	17	34
had rather V	-	-	-	-	-	-	-	2	2
must V	3	4	7	-	3	3	18	30	48
BE to V	-	-	-	1	5	6	3	5	8
BE going to V	13	15	28	9	3	12	2	-	2
BE supposed to V	-	1	1	-	2	2	2	3	5
(perfect tense) have + V past participle	14	36	50	48	77	125	75	69	144
(progressive) BE + V-ing	64	53	117	55	62	117	25	30	55
get + V past participle	1	2	3	3	5	8	1	3	4
BE + V past participle (passive)	23	27	50	86	56	142	92	93	185
Total	264	301	565	364	402	766	448	517	965
(Not auxiliary) there expletive	38	36	74	33	40	73	19	22	41

The scores for each student on each item listed above and also on various combinations of items were subjected to an analysis of variance, 2 x 3 factorial. The only items found significant are as follows:

Perfect tense: for grade at the .01 level
Progressive: " " " " " "
Passive: " " " " " "
Total of first 6 modals: " " " "
Total of can and could: " " .05 "
and for interaction of sex and grade at .05 level

Three different forms for the future are of at least minor interest. For instance, will is used twenty-five times as often as shall. Only by the oldest grade is shall used at all.

The "BE-going-to" future has a curious development. Apparently it is learned early and then falls into disuse. It is used 28 times by fourth graders, less than half as often -- 12 times -- by eighth graders, and only twice by twelfth graders. No doubt more formal methods of expressing the future take its place.

Unlike "BE-going-to," the "BE-to" future emerges late. It is not used at all by fourth graders, but appears 6 times with eighth graders and increases to 8 with twelfth graders.

In summary, then, the auxiliary becomes more complex with successively older grades with (1) an increase in the frequency of modals, (2) an increase in the frequency of perfect tense forms, and (3) an increase in the frequency of passives.

The Classes Of Full Verbs

The term "full verb" is here meant only to exclude auxiliary uses of verbs, for a few verbs can be used both as full verbs and as auxiliaries even in the same sentence (I have had my lunch. He doesn't do very well. She is being difficult.) The great majority of verbs discussed here were written in their finite forms (with tense markers), but non-finite uses are included here as well.

In all grammars verbs are classed according to what structures follow them. Distinctions between transitive, intransitive, and linking verbs, for instance, are made on this basis. Transformational grammarians have classified verbs in this way too, and have extended the classification somewhat by noting whether the verb can or cannot participate in certain other transformations.

The classification used here follows, in the main, that of Lees (The Grammar of English Nominalizations), though certain changes have been made. All verbs used by all students were tabulated in twenty-five different classes.

A Hypothesis About Verb Complements

At the outset the main interest for the investigators lay in discovering whether verbs which take whole transformed sentences as their complements appear with about equal frequency at all grades, or whether they increase in frequency in the older grades. If the frequency is equal, that would suggest that such structures are mastered before a child reaches fourth grade. If they should increase, then that would suggest that they are not fully mastered by the fourth grade.

The evidence of this study indicates that complement verbs are fully mastered by the fourth grade. There is no convincing evidence of growth in their use. Sample verbs of the sort in question appear in Table 35 along with the frequency of each type.

There is no convincing evidence that any other verb complements have not been mastered by the average fourth grader.

Transitive Verbs With Noun Or Adjective Complements

There appears to be no significant difference between the grades in their use of transitive verbs that take noun or adjective complements, though

Table 35--Verbs With Transformed Predicates As Complements, For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Intransitive verbs									
We avoided going We refrained from going	1	17	18	10	10	20	6	-	6
We expect to go	35	20	55	23	37	60	33	51	84
We hated for him to go	21	35	56	18	23	41	17	15	32
Total	57	72	129	51	70	121	56	66	122
			106%			99%			100%
Transitive verbs									
We caught them going We kept them going	3	6	9	3	6	9	7	1	8
We persuaded them to go	23	35	58	29	39	68	24	34	58
Total	26	41	67	32	45	77	31	35	66
			101%			117%			100%

there is a shift in preference from one sort of complement to the other. (Table 36)

These complement sentences may be regarded as derived from two sentences, one a sentence with be followed by either a predicate adjective or predicate nominal. Thus "We considered John" plus "John is the leader" can produce "We considered John the leader." Similarly "We considered John" plus "John is lazy" can produce "We considered John lazy."

Table 36 Transitive Verbs With Noun Or Adjective Complements, For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
We elected John chairman									
We considered John the leader	3	2	5	7	9	16	11	15	26
We considered John lazy	13	22	35	7	10	17	9	-	9
Total	16	24	40	14	19	33	20	15	35
			114%			94%			100%

Complements Of Place And Motion

Some verbs require after them a complement of place or direction: "He put it on the desk," "She glanced away," "Mr. Bryant resides in Chicago." This linguistic fact might be stated semantically by saying "One must put something some place; one must glance in some direction; one must reside at some place." These complements cannot be moved like ordinary adverbial modifiers. We do not say "In Chicago Mr. Bryant resided," "Away she glanced," "On the desk he put it."

Younger students used all three kinds of verbs, especially those with complements of motion, more often than did older students. Perhaps that was because they wrote more often about people being places and, more especially, going places. (Table 37)

Transitive Two-word Verbs

Many verb-particle pairs which take objects are best classed as two-word verbs. Some like look for, look into, look at cannot be separated by their objects (We do not say "He looked his glasses for," "He looked the matter into", "He looked the picture at"). These verb-particle combinations are called inseparable.

Other combinations may be separated by a noun object, and indeed must be separated if the object is an unstressed pronoun. (We may say "He looked the answer up." We may also say "He looked it up," and may not say -- meaning the same thing -- "He looked up it.") These are called separable combinations.

Inseparable two-word verbs increased in frequency: 84, 97, 113. On the other hand separable two-word verbs decreased in frequency: 100, 59, 57. Perhaps one set is conversational and becomes replaced by more learned equivalents later on. Of course it is also possible that the difference is due to non-linguistic factors such as subject matter.

The increase in one roughly offsets the decrease in the other. (Table 38)

Table 37--Verbs With Complements Of Motion Or Place, For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Intransitive verbs with complements of motion									
He went to the store	271	222	493	155	148	303	57	58	115
Intransitive verbs with complements of place									
They live in town	50	45	95	24	35	59	14	22	36
Transitive verbs with complements of place									
He put it on the desk	29	38	67	18	27	45	22	22	44
Total	350	305	655	197	210	407	93	102	195
			335%			210%			100%

The scores for each student on each type of verb and on the totals of the first two types were subjected to an analysis of variance, 2 x 3 factorial. The first type is significant for grade at the .01 level.

The total of the first two types in significant for grade at the .01 level.

Table 38--Two-word Transitive Verbs, for Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Inseparable two-word transitive verbs									
He looked for his glasses	51	33	84	57	40	97	62	51	113
Separable two-word transitive verbs									
He looked the answers up	50	50	100	38	21	59	36	21	57
Total	101	83	184	95	61	156	98	72	170
			108%			92%			100%

Indirect Object Verbs

Indirect object verbs are used most frequently by fourth graders, then less frequently by eighth graders, and then more frequently by twelfth graders. No significance is apparent in this change. (Table 39)

Table 39 Indirect Object Verbs, For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
We gave her a present (to her)	48	53	101	15	31	46	32	27	59
We bought her a present (for her)	3	2	5	-	1	1	5	1	6
Total	51	55	106	15	32	47	37	28	65
			163%			72%			100%

Verbs Of Saying, Thinking, Etc.

Verbs followed by direct discourse, or by other noun clauses, appeared without significant difference in frequency from grade to grade, though direct discourse was favored by fourth graders, and other noun clauses were favored by twelfth graders. This has been discussed in the section on subordinate clauses.

Verbs Like Go Fishing

Fourth graders and eighth graders use constructions like go fishing, go hunting, more often than twelfth graders do. Perhaps these expressions indicate a linguistic immaturity, or perhaps they indicate only that the younger children wrote more often about people's physical activities. The frequency of this verb form was 29, 30, 11.

Verb Phrases Like Have a Tooth Pulled

This construction may be used to indicate that someone else performs an action for whoever is subject of the verb. Perhaps it is derived from something like "He had ___" and "His tooth was pulled by the dentist."

This construction was used infrequently, but more often by twelfth graders: it occurred 4, 1, and 15 times.

Simple Transitives, Intransitives and Pseudo-transitives

Simple intransitive verbs decrease markedly from the two early grades to the twelfth grade. No reason for this is apparent. (Table 40)

Simple transitive verbs, on the other hand, increase from the first two grades to the twelfth. Again no reason for this is apparent.

There is another group of verbs called mid-verbs, or pseudo-transitives, or defective transitives, which are followed by nouns like transitives. However, pseudo-transitives cannot form passives or take manner adverbs as can transitives.

Have is the commonest pseudo-transitive, and many verbs of measure fall into this group too. They became slightly less frequent from grade to grade.

Linking or Copula Verbs

The various types of linking verbs, not counting forms of BE, appear also without significantly different frequency between grades. (Table 41)

Table 40--Simple Transitive, Intransitive and Pseudo-transitive For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Simple intransitives									
They came quickly	155	181	336	140	200	340	98	83	181
Simple transitives									
He opened the window quickly.	468	395	863	438	407	845	456	508	964
Pseudo-transitives									
It cost three dollars	65	68	133	57	69	126	58	50	108
Total	688	644	1332	635	676	1311	612	641	1253
			106%			105%			100%

The scores for each student on each type of verb were subjected to an analysis of variance, 3 x 3 factorial. The scores on simple transitives were significant for grade at the .01 level.

Table 41--BE And Other Linking Verbs, For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Linking verbs									
We felt confident	2	1	3	-	2	2		1	1
We seemed confident	5	1	6	9	8	17	7	3	10
We became leaders We became confident	12	20	32	10	20	30	25	22	47
Total	19	22	41	19	30	49	32	26	58
			71%			84%			100%
BE	255	285	540	269	278	547	303	383	686
			79%			80%			100%

The scores of each student on all types of verbs were subjected to analysis of variance, 2 x 3 factorial. BE was found significant for grade at the .01 level.

The Verb BE

Curiously enough, the verb BE, as a full verb (not as an auxiliary in the progressive tense or in the passive) was used with special frequency by twelfth graders. This means of course that the predicate nominal or predicate adjective constructions, etc., were used more often by more mature students. The frequency of predicate adjectives will be discussed in a later section.

Summary of Full Verbs

1. The evidence produced here indicates that fourth graders have mastered every one of the twenty-five different classes of verbs.

2. Apparently the analysis of predicates according to verb type is not a fruitful area of investigation with children as advanced as the average fourth grader, unless perhaps the frequency of motion and place complements is meaningful, as will be seen in the next section.

3. The analysis of the verb auxiliary may be fruitful.

8. FINDINGS: ADVERBIALS

Modifiers of Verbs

Every kernel sentence will contain a subject and a predicate. The subject will be one of the simpler nominals already discussed. The predicate may contain some of the auxiliary verbs discussed, and must contain one of the full verb structures. That full verb may have any of various objects and complements attached to it. In addition the predicate may contain certain modifiers of the verb, and to them we now turn our attention.

No sentence-combining transformation is needed to attach to a verb a single word adverbial (*yesterday*, *hastily*, *inside*) or a prepositional phrase adverbial (*with haste*, *in the house*, *on Tuesday*). Adverbials are optional elements of kernel sentences.

These modifiers survive many of the sentence-combining transformations, so they may appear in subordinate clauses, but also in many non-clause constructions: "that *frightfully* troubled fellow" (from "Something troubles the fellow frightfully").

The Decline in Adverbials of Time and Place and Motion

In discussing the words that introduce movable adverbial clauses we noticed that *when*-clauses--no doubt signifying time--declined in frequency from 101 to 73 to 51. They dropped to half the original frequency. We observe now that non-clause adverbials of time also decline, and again the decline is to half the original frequency, but this decline occurs only in the second half of the time-span: 525, 631, 275. (Table 42)

In discussing full verbs (Table 37) we noticed that complements of

Table 42- Non-clause Adverbials Of Time, Place, and Motion Used As Complements And As Modifiers Of Verbs For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Non-complements									
Non-clause adverbials of time	249	276	525	332	299	631	144	131	275
Non-complement adverbials of motion	73	62	135	48	56	104	23	33	56
Non-complement adverbials of place	60	76	136	65	47	112	61	49	110
Total motion and place only			271			216			166
Total time, motion and place			796 181%			847 192%			441 100%
Complements plus non-complements (Complements are from Table 37)									
Non-Comp. plus comp. of motion	344	284	628	203	204	407	80	91	171
Non-comp. plus comp. of place	139	159	298	107	109	216	97	93	190
Total comp. and non-comp. of place and motion			926 258%			623 173%			361 100%
Total comp. and non-comp. of time, place and motion			1451 228%			1254 197%			636 100%

For each student several different scores mentioned above were subjected to analysis of variance, 2 x 3 factorial. The significance is as follows:

Comp. plus non-comp. of motion: for grade at .01 level
Comp. plus non-comp. of time: for grade at .01 level
Total of time, place, motion: for grade at .01 level

place and motion also declined in frequency. We observe now that non-clause non-complement adverbials of place and motion also decline, from 271 to 216 to 166. The total of such complements and such modifiers of place and motion is 926, 623, 361 (258%, 173%, 100%).

This over-all reduction in adverbials of time and place and motion is perhaps due in part to a shift away from narratives about people doing things in time and at places.

The total of all such non-clause adverbials of time, place and motion is thus 1451, 1254, 636. In percentages the decline is from 228% to 197% to 100%. These changes from grade to grade, and the values for boys and girls, are summarized in Table 42.

The Increase in Adverbials of Manner, etc.

Adverbials of manner increase with maturity, from 200 to 290 to 352. They almost double. The increase is observable both in the single-word and the prepositional phrase varieties, as Table 43 indicates.

Adverbial modifiers of types other than those mentioned thus far also increase: 62, 69, 154.

One Reason Clauses Do Not Lengthen More

Already we have seen that nominals increase substantially in complexity and, we would infer, in length for each older grade. In view of that fact we might be puzzled by why the length of clauses does not increase proportionately after the eighth grade.

We are now able to offer at least a conjectural explanation. Adverbial expressions decline almost 500 between eighth grade and twelfth (Table 43),

Table 43- Adverbials Of Manner, Etc., For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Adverbials of manner									
Single words	36	57	93	62	82	144	66	67	133
Prepositional phrases	39	49	88	57	76	133	88	110	198
Sub-total			181 55%			277 84%			331 100%
Other adverbials, not time, place, motion or manner	17	45	62 40%	32	37	69 45%	86	68	154 100%
Total of manner & other			243 50%			346 71%			485 100%
Adverbials of time, place and motion from Table 42			1451			1254			636
Total of all non-clause adverbials related to verbs			1694 151%			1600 143%			1121 100%

The significance of manner adverbials, by analysis of variance, 2 x 3 factorial, is for grade at .01 level.

and that decline will impede the lengthening of clauses. We cannot be sure how much effect it has, but many adverbials are prepositional phrases, and they can achieve considerable length as their objects are expanded by modification. The fact that fourth and eighth graders use many of these complement and non-complement adverbials will help keep their clauses as long as they are. When twelfth graders stop using so many, their clause length will suffer even though their increased length of nominals will more than offset the drop.

Adverbial clauses increase in number from eighth grade to twelfth, but of course that increase is irrelevant to the matter discussed here. And, in comparison to the drop in non-clause adverbials, the gain of only 17 movable clauses from grades eight to twelve seems insignificant.

Attributive Adverbs

Attributive adverbs such as very, extremely, really were used preceding adjectives by all grades. They increased in frequency from fourth to eighth grades (106, 178, 163).

Attributive adverbs were also used before adverbs by all grades (28, 22, 31 times).

Sentence Adverbials

In addition to adverbials that relate to the verb within their own clause, there are adverbials which relate one T-unit to the preceding T-unit. Examples are generally, perhaps, of course, maybe, after all, also, especially, ultimately, above all, most important, finally, obviously, in turn.

These increase considerably from fourth to eighth grades, but not significantly from eighth to twelfth. (74, 130, 132)

Preverbs

The adverbs here called preverbs are those affirmatives or negatives which ordinarily precede the main verb. The commonest examples are not, n't, never, only, always, just. Fourth graders used them often, 172 times, in fact more than eighth graders did (163 times), but less often than twelfth graders did (209 times).

Summary of Non-clause Adverbials

A summary of the statistics on non-clausal adverbials related to verbs is as follows:

(1) Those signifying time, place and motion decrease to about half their original frequency.

(2) Those signifying manner about double in frequency.

(3) Other adverbials double in frequency.

(4) Since the adverbials of time, place and motion, which decrease, are about four times as common as the others, which increase, the net result is a decrease in non-clause adverbials from 151% to 143% to 100%.

A summary on the other special classes of adverbs is as follows:

(1) Attributive adverbs were used before adjectives 106, 178, 163 times.

(2) Attributive adverbs were used before adverbs 28, 22, 31 times.

(3) Sentence adverbials were used 74, 130, 132 times.

(4) Preverbs were used 172, 163, 209 times.

Sentence-combining transformations are not used to produce any non-clause adverbials.

9. FINDINGS: PREDICATE ADJECTIVES AND ADJECTIVE COMPLEMENTS

In kernel sentences, adjectives following forms of BE and certain other linking verbs are called predicate adjectives: "Jimmie is fast." Such sentences can be combined with certain other hypothetical sentences such as "We considered Jimmie ________" to produce the adjective complement sentence "We considered Jimmie to be fast" or "We considered Jimmie fast."

The two younger grades used simple predicate adjectives with about equal frequency, but twelfth graders used them distinctly more often: 167, 161, 225. Simple adjective complements were not used commonly by any grade, but were used distinctly more often by twelfth graders: 3, 10, 22. The total for simple predicate adjectives and predicate complements was 170, 171, 247; the percentages were 69%, 69%, 100%. (Table 44)

In addition to simple predicate adjectives and adjective complements, each grade used complex adjectives with their own complements as will be shown in the next section.

"Complex" Adjectives With Their Own Complements

Adjectives in predicate position and complement position can take a variety of their own complement structures, including clauses, infinitives, and prepositional phrases. With such complements, the adjectives are called "complex."

The clause complement, as in "He is glad (that) you can go," may be regarded as formed by a sentence-combining transformation from "He is glad" and "You can go." These were mentioned in the section on subordinate clauses. Such clause complements were used more frequently by twelfth graders than by the younger students: 7, 7, 13.

Table 44 Simple Predicate Adjectives and Predicate Complements For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Simple predicate adjectives	74	93	167	80	81	161	85	140	225
Simple predicate complements	1	2	3	3	7	10	8	14	22
Total			170			171			247
			69%			69%			100%

According to analysis of variance, 2 x 3 factorial, the significance of predicate adjectives is both for grades and for sex at the .05 level.

The infinitive complements are of three sorts. "He is glad to go" may be derived from "He is glad" and "He will go." The second sort, "He is smart to go" may be similarly derived, but it can be transformed into, "For him to go is smart," whereas the first infinitive cannot be transformed into "For him to go is glad." The third sort, "He is easy to understand" may be derived from "(For us) to understand him is easy." That in turn may be derived, like other infinitival nominals, from "Something is easy" and "We understand him." This latter sentence is altered and then replaces "something."

The increase in frequency for these infinitive complements was very substantial. The totals were 8, 28, 92. In percentages the increase was 9% to 31% to 100%.

The prepositional phrase complement "glad for him" or "glad about it" is structurally the simplest. It requires no sentence-combining transformation for its production. It too increased with older grades: 20, 28, 69.

The totals of all complements were 35, 62, 134: in percentages, 26%, 46%, 100%. (Table 45)

Table 45- Complements To Adjectives For Each Grade

	Grade 4			Grade 8			Grade 12		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Clause complement									
glad (that) you can go	4	3	7	2	5	7	2	11	13
Infinitive complement									
glad to go	4	3	7	7	13	20	18	27	45
smart to go	-	-	-	7	-	7	1	2	3
difficult to understand	-	1	1	-	-	-	1	3	4
Sub-total			8			27			52
Prepositional phrase complement glad for him	8	12	20	13	15	28	19	50	69
Total all complements			35 26%			62 46%			134 100%

According to analysis of variance, 2 x 3 factorial, the significance for prepositional phrase complements is for grade, and for sex, and for the interaction of sex and grade all at the .01 level.

10. SUMMARY

Thirty years ago LaBrant observed that the clauses written by grade school children tended to become a little longer as the writers matured, and that clauses written by eminent psychologists were much longer. Both those observations have now been related to the more comprehensive observation that T-units, both single-clause and multi-clause, become successively longer between grades four and twelve, and that both the single-clause and multi-clause varieties increase at about the same growth rate. The lengthening of single-clause T-units can be accomplished only by the addition of non-clause structures, whereas the lengthening of multi-clause T-units can be accomplished by the addition of both clause and non-clause structures.

An extensive analysis has been completed to discover just what those added structures are. No doubt there are many structures which this analysis has not uncovered. But what it has uncovered is indeed interesting. The major growth occurs in the nominal structures. A slight growth occurs in the verb auxiliary, but that would have an almost negligible effect on the average length of T-units. Modifiers of verbs do not contribute to the greater length, for the twelfth graders write almost 500 fewer non-clause adverbials than do eighth graders (and write only 17 more movable adverbial clauses). There is no increase in coordination to lengthen T-units.

The nominals are expanded by the use of noun clauses and near-clauses, and by the use of many modifiers, some clausal but mostly non-clausal.

It is especially interesting to note that non-clause verb modifiers, which decline, are not produced by sentence-combining transformations, whereas the great majority of structures which have been found to increase are produced by combining sentences.

It would be worthwhile, then, to total all the sentence-combining transformations which have been observed. They appear in Table 46.

That total can be related to the growth of T-units in this fashion. Every T-unit contains at least one main clause. That clause is at least a kernel sentence, and more probably a kernel expanded at any of many points by the incorporation of other kernel sentences. Table 46 indicates that the average kernel sentence in the main clause of a fourth grade T-unit has absorbed 1.4 other kernel sentences. The average main clause kernel in an eighth grade T-unit has absorbed 2.4 other kernel sentences. The average main clause kernel in a twelfth grade T-unit has absorbed 3.4 other kernel sentences.

It is that absorption of more kernel sentences that appears to account for the lengthening of T-units, both single clause and multi-clause. It probably also accounts for the greater "density" of grammatical structures in more mature writing. It appears to be the most comprehensive characteristic of maturity in writing.

The older student can incorporate and consolidate more grammatical structures into a single grammatically independent unit. Unless we suppose that the older students' kernel sentences have less thought content than the younger students', then we can say too that the older student can incorporate a larger body of thought into a single intricately-related organization.

Table 46- Summary Of Sentence-combining Transformations Produced By Each Grade

	Grade 4	Grade 8	Grade 12
Coordination (The number of sentence-combining operations required to coordinate X items is X - 1)			
Inside T-units but outside nominals (From Table 22)	419	530	361
Inside nominals (Table 31)	32	74	102
Appositives (Table 30)	35	58	62
Nominals (See Summary on Nominals)			
Modifiers	1678	2291	2577
Non-headed structures	411	409	660
Complements to verbs			
Verbal (Table 35)	196	198	188
Noun and Adj. (Table 36)	40	33	35
(Have a tooth pulled)	4	1	15
Movable adverb clauses (Table 20)	222	252	269
Complements to Adjectives			
Clauses (Table 45)	7	7	13
Infinitives (Table 45)	8	27	52
Comparisons			
Clausal (Table 19)	8	17	10
Reduced clauses	9	16	15
Total of sentence-combining transformations used	3069	3913	4349
Number of T-units	2130	1607	1276
Mean transformations per T-unit	1.4	2.4	3.4

11. CONCLUSIONS

When I first began this study a colleague who had taught freshman English with me for many years asked me what I was up to. I described the project to her, and asked her what she supposed I'd find out. "Why it's obvious. After thousands of hours of work you'll find out that younger children write as sentences what older children would reduce to phrases and words." That is very close to what has been found out. However, the findings have been somewhat more specific.

1. The structures which were tabulated here were used, almost without exception, by the youngest writers.

2. Nonetheless, many of those structures were used with significantly greater frequency by older students. In the great majority of instances the ones which increased were the very ones produced by sentence-combining transformations.

However, not all structures, even those which result from sentence-combining transformations, increase with age. Verb complements, for instance, do not. Consequently this study can be said to have identified, to have isolated, some of what are apparently growth buds.

12. IMPLICATIONS FOR FURTHER RESEARCH IN WRITING DEVELOPMENT

1. In language development studies it is possible for the investigator to control, to some extent, the stimulus for the writing, or to leave it controlled only by normal school routine as was done here. Almost all the writing children do is done for school.

Either procedure has its limitations and its advantages. For instance, if the twelfth graders had been instructed to write narratives, they could have done so, and their doing so might have affected their choice of structures: they might have used fewer long nominals, more direct discourse, and more adverbials of time, place, and motion. However, twelfth graders characteristically write less narrative and more abstruse exposition. To have restricted them to narration would have obscured certain differences, even though it might have highlighted others.

2. Choosing language samples of uniform size, and groups of uniform size, is an obvious convenience in reporting findings. It greatly facilitates comparisons.

3. For quantitative studies of writing development of average students up to, perhaps, the eighth grade, sentence length is not a significant unit. Either the "sentence" must be re-defined according to some highly subjective meaning-oriented criterion, or the investigator must abide by the student's own punctuation. If he chooses the latter, his results are likely not to reveal any significant development.

4. The clause is an objective unit, and in grades up to about the eighth for average children, its length may reveal some significant development. However, clause length has been studied many times already, and a study

of it by itself is likely to reveal nothing new.

The study of non-clause structures appears to be quite as significant as a study of clauses, indeed much more significant.

5. In studying the frequency of subordinate clauses, the number of elements coordinated within the clause should be studied separately if it is studied at all. A part of a clause, such as a part of the finite verb phrase, should not be tabulated as if it were a whole clause.

6. Coordination between T-units needs to be distinguished from coordination inside T-units. The one kind of coordination is used to considerable excess by certain fourth graders, but the other kind appears not to be used excessively by anyone.

7. Coordination between T-units may be a significant index of growth at levels above the eighth grade, but it appears not to be below that level.

8. As a unit of length, the shortest grammatically terminable unit, or T-unit, appears to be more worthy of further study than the units which have usually been studied, specifically sentence length, clause length, and subordination ratio.

9. A unit of length which might or might not be more revealing than the T-unit as here defined, would be one which did not call for separations where but, so, or and nor joined main clauses (with their subordinate clauses), but which did call for separations where and joined them.

10. The sentence-combining part of transformational grammar offers an especially promising approach for writing development studies. For studies of very young children the phrase structure part of transformational grammar is also revealing, but by the time a child begins to write he is far beyond the kernel sentence, phrase structure stage.

11. The treatment of nominals as whole combinations of elements is sufficiently revealing to suggest that a similar treatment of whole T-units (which of course include nominals) might also be rewarding. Such study is facilitated by machine sorters.

12. A study using methods comparable to these but applied to the writings of professional writers might be revealing. Among other things, it would show the point at which certain developments stop. For instance, T-units appear to increase with maturity, but perhaps they do not increase beyond the length typical for twelfth graders.

13. Analysis of the sort employed here would be more revealing when applied to longitudinal samples than to the cross sectional samples used here. Cross sectional materials were used here in the hope that they would suggest the kinds of things to look for in writings less broadly separated by the ages of the writers.

14. A study comparable to this one should be made for writings by students of "superior" and "inferior" language ability as determined by other objective language tests.

15. Transformational grammar is not yet advanced far enough to be substantially concerned with what might be called stylistic transformations. Such transformations could indeed be incorporated into a transformational grammar. As more are incorporated the insights provided by an analysis such as this will become more fruitful.

Eventually, no doubt, substantial work can be done on inter-sentence relationships, and on momentary ambiguities in sentences.

It may well be that the advanced writer distinguishes himself by the use of sentence-combining transformations which have entirely escaped the analysis given in this exploratory study.

13. IMPLICATIONS FOR THE CURRICULUM

1. This study provides no evidence at all on the question of whether the description of grammatical structures should be part of the school curriculum. However, where that description is such a part, this study does have at least one definite implication.

At present the study of grammatical structures is cut up into little gobbets and scattered widely over several years of the English curriculum. One consequence of this scattering is that "grammar is always reviewed but never taught." No English teacher knows which fragments previous teachers have undertaken. Every teacher discovers that in a given class of children some know considerable grammar and others just as able know virtually none.

This scattering appears to be motivated at least in part by the notion that some structures are used only by older children, and so should be taught only to them. This study provides strong evidence against such motivation. The structures studied here are at least as complex as those studied in most school grammar courses. Yet they are virtually all used by fourth graders, and are used often enough to indicate that fourth graders command them. This study provides no justification for not going straight through a course in grammatical structures once such a course is begun.

The time when such a course should be begun must be determined by the same kind of considerations that determine when a course in mathematical abstractions or in physical science should be begun. Such considerations are not related to the subject of this study.

The order of arrangement of the parts in such a course should be the most teachable one: students will be using all of the structures long before the course is begun.

2. This study suggests a kind of sentence-building program that probably has never been produced. Such a program would deal with sentence-combining transformations.

Obviously such a study could come after the constituent structure section of a course in transformational grammar. The student could be exercised in the process of combining kernel sentences into more complicated sentences. He could also be given complicated sentences to break down into kernel sentences.

Whether the process of sentence-combining can be taught outside a course in transformational grammar remains to be seen. Perhaps the process can be taught without going into the phrase-structure of the component sentences. The examples given in this study have seldom been accompanied by any analysis of the component sentences. If those examples have been clear, then perhaps the whole matter could be approached in a similar fashion. In teaching English to foreigners it is now customary to give a great deal of drill with a minimum of abstract description. Perhaps a similar program is feasible for native speakers and writers.

Whether the sentence-combining process should be taught at all is not self-evident. If skill in that process is the most important factor in sentence maturity, then a teacher is certainly tempted to try to force the growth.

But forced growth is not always firm growth. It may be that the older student's ability to write longer T-units, incorporating a larger number of kernel sentences, comes only as a result of years of physiological and experiential maturing. It may come only with the development of all thought processes. In that event, attempts to force growth will not succeed. Nonetheless, the experiment should be made.

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